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POPULAR
HISTORY OF BRITISH MOSSES.

Bryum ligulatum.

B argenteum.

B cæspiticium.

A

POPULAR HISTORY

OF

BRITISH MOSSES,

COMPRISING A

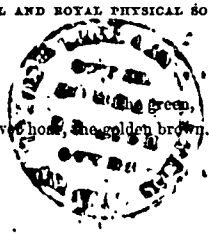
GENERAL ACCOUNT OF THEIR STRUCTURE, FRUCTIFICATION, ARRANGEMENT, AND GENERAL DISTRIBUTION.

34114

BY

ROBERT M. STARK,

FELLOW OF THE BOTANICAL AND ROYAL PHYSICAL SOCIETIES OF EDINBURGH.



"... the green,
The silver ... the golden brown."

LONDON:

LOVELL REEVE, HENRIETTA STREET, COVENT GARDEN.

1854.

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JOHN EDWARD TAYLOR, PRINTER,
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TO

ROBERT KAYE GREVILLE, Esq., LL.D.,

EDINBURGH,

AND TO

GEORGE WALKER ARNOTT, Esq., LL.D.,

PROFESSOR OF BOTANY, GLASGOW,

WHOSE LABOURS

IN BOTANICAL, AND ESPECIALLY BRYOLOGICAL SCIENCE,

ARE EXTENSIVELY KNOWN AND HIGHLY APPRECIATED,

This Little Work

IS, WITH EVERY SENTIMENT OF RESPECT AND ESTEEM,

DEDICATED, BY THEIR GRATEFUL FRIEND,

THE AUTHOR.

PREFACE.

MANY years have elapsed since Dillenius gave to the world his 'Historia Muscorum,' a work greatly in advance of his predecessors, and displaying an amount of research and accuracy, both in the description of the plants and accompanying illustrations, the value of which is appreciated by Botanists at the present day. Rich however though this 'History' was, compared with those of previous authors, the rapid progress of discovery since its publication has thrown it comparatively into the shade. The number of new species has been greatly increased, and much new light thrown on their structure and physiology. The labours of Hooker, Greville, Arnott, Bridel, Weber, Bruch, and others, have led to these important results.

Though Mosses are among the minuter and seemingly insignificant of Nature's works, they, in common with other Cryptogamic forms of vegetation, deserve a share of attention from even those who may not make them objects of scientific study. In this section of the botanical field, the late Mr. W. Gardiner, of Dundee, is the only British Muscologist who has treated of Mosses in a popular style; and it is gratifying to know that his 'Lessons on British Mosses' have been so highly approved as to have already gone through several editions. He truly says, in the preface to his work, that "this very beautiful and interesting portion of Nature's works is calculated to open up an ample source of innocent and rational amusement, and a thirst for that kind of knowledge which enlarges and purifies the heart." It is almost superfluous to refer to the elaborate details of Sir W. J. Hooker's second volume of the 'British Flora' (from which most of the generic and specific characters employed in this work are taken), which has greatly increased the number of students of Muscology.

The following work aims at taking a medium place, and

has been drawn up in the leisure intervals permitted by business, with a view of presenting, as far as possible in a popular shape, this interesting family of plants.

They must however be made the objects, more or less, of scientific study and research, before their beauty can be thoroughly appreciated, so that it has not been attempted to do away with technical terms. These terms, we are persuaded, will, with the assistance of the Glossary, be easily mastered by those who really are or get interested in the subject; and their investigation will, it is hoped, prove a suitable preparative for such as may afterwards apply to works of greater detail and more scientific pretensions.

The Author returns his best thanks to those who have aided him by contributions of specimens, drawings, and the use of valuable works beyond his reach.

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POPULAR HISTORY

OF

BRITISH MOSSES.

CHAPTER I.

INTRODUCTION.

"The moss growing on the wall-top is looked on by many with an eye of contempt, but to those who will examine its structure and functions it affords a source of infinite admiration."

"The green,
The silver hoar, the golden brown.'

THOUGH Mosses, notwithstanding their minuteness, are important agents in the economy of nature, it is only within a very recent period that their structure and history has been thoroughly investigated by the students of Botanical Science. No doubt mention is made of them by various writers of antiquity, but in a very cursory way, and therefore it is not necessary for our purpose to go further back

than towards the close of the seventeenth century, when the celebrated Ray, by his elaborate works, gave a vast impetus to botanical research. Following him at the interval of from forty to sixty years, we find Dillenius of Oxford, and the great Linnæus, elucidating still further the structure and classification of these minute members of the vegetable kingdom. The former of these authors, however imperfect his knowledge of the subject is regarded at the present day, has left an imperishable memorial of his talents and industry in the 'Historia Muscorum,' illustrated by a series of plates, whose accuracy is in some instances still unsurpassed. The defects of his system however will at once be perceived, when we mention that he classed among Mosses such plants as Lichens and Confervæ.

It was reserved for Hedwig, a German botanist, in 1782, to withdraw the veil that had hitherto obscured the science of Muscology, and by his microscopic researches, in investigating the structure and fructification of these minute plants, to open up a field untrod by any of his predecessors. As we proceed we shall have occasion to avail ourselves of the stores of knowledge he thus disclosed.

Since his day many botanists of note have devoted themselves to the study of Bryology, among whom we especially

mention Schwægrichen, Weber, Mohr, Bridel, Schimper and others, and in our own country, Smith, Hooker, Walker-Arnott, Greville, Wilson, with many more, to whose published works we shall frequently have occasion to refer.

Our purpose is now to examine briefly the claims that the Mosses have on our attention, whether we regard them as objects of study, as bearing on their use in the economy of nature, or as ministering to the physical wants and comforts of the animal kingdom, including man himself. We presume there are none of our readers who will think, in this enlightened age, that because objects are small they are on that account unworthy of study and investigation. Otherwise, as has been remarked, "the horse is superior to its rider;" and one of old, Solomon, the wise king of Israel, has set us an example in this very particular, by being conversant with the "hyssop" on the wall, which by Hasselquist is regarded as a minute moss still found on the walls of Jerusalem. We know, in the animal kingdom and some departments of the vegetable, how important the meanest and most insignificant beings are in the operations of nature, and assuredly in this respect the Mosses yield to none.

"'Tis Nature's livery o'er the globe
Where'er her wonders range;"

for, as far as Britain is concerned, it has been computed by Dr. Johnston, in speaking of the genus *Hypnum*, that it forms perhaps a fourth part of the vegetable clothing of this island. The first vegetation that appears on new buildings evidencing itself by green stains, on recently raised coral-reefs, and on volcanic ashes, is composed chiefly of the young confervoid shoots of Mosses; and when these have by their decay prepared a small film of vegetable mould, they yield their place to plants of more complicated structure, till at length trees of colossal growth cover what was once a barren waste. This fact alone shows their vast importance in the economy of nature. When the Creator of all beheld everything he had made, and said it was "very good," the humble moss was equally his care and delight with the lofty monarch of the forest, and therefore in it should we see His power and goodness displayed.

Again, the benefit of the study of these minute objects is not less beneficial, but rather more so, on account of minuteness, and it is with pleasure that I avail myself of a few paragraphs much to the point on this subject, from the article "Musci" in the Edinburgh Encyclopædia, vol. xv. "It has been observed by a writer equally elegant and profound (Pascal), that 'man is placed in the middle between the two

infinities—the infinitely great and the infinitely little—both of which are incomprehensible to him.' Of these two extremes it is perhaps the most useful to recall the attention frequently to the latter. The changes that occur in nature on a great scale can scarcely fail to occupy occasionally the thoughts of even the busiest and least reflecting, but the infinitely little, and whatever approaches to it, is less obtrusive. Yet not less than the great orbs revolving in the immensity of space, do objects almost mocking human sense by their minuteness, furnish a fund for scientific investigation. In order to demonstrate those truths which form the basis of natural religion, Paley preferred the structure of the human body to a survey of the universe, and Boyle considered the eye of a fly as being a better proof of design than the sun himself, though the life and soul of our planet, because we have better means of becoming acquainted with the minuter objects compared, than with the greater. Wherever the adaptation of parts to the attainment of an end can be traced, the proof of design is complete; and he who could examine the nutrition, the growth, the regular conformation, the provision made for the continuance of the species of even the minutest moss, without perceiving in them proofs of intelligence, power, and goodness, would probably receive

no more conviction from the sublimest truths that astronomy can unfold." From these reflections we may infer one important purpose served by these minute plants, in supplying such an ample fund of instruction and pleasure to the contemplative mind, and with the botanist and poet may well exclaim—

> "The tiny moss, whose silken verdure clothes
> The time-worn rock, and whose bright capsules rise,
> Like fairy urns, on stalks of golden sheen,
> Demand our admiration and our praise,
> As much as cedar kissing the blue sky,
> Or Krubul's giant flower. God made them all,
> And what *He* deigns to make should ne'er be deem'd
> Unworthy of our study and our love."

Having adverted thus far to this topic, we proceed now to examine a little more in detail the use of the Mosses in the economy of the vegetable kingdom.

The protection they afford to the roots of other plants and to the stems of trees, is one of the most obvious. They abound chiefly in the temperate and frigid zones, and are the principal vegetable inhabitants of those wintry wastes where the summer heats scarcely affect the frozen surface to the depth of a few inches. In a climate such as ours, where with the change of season vegetable life is exposed for

one half of the year to the rigours of winter, and for the other to the drought of summer, no contrivance could be more suitable as a protection than the loosely netted branches and leaves of *Hypnums* and other Mosses, and of this fact the experienced horticulturist knows well how to avail himself at these seasons. By many they have been deemed as injurious, in intruding themselves into the blank spaces in grass-lands left bare by the decay of herbage. In this case however they bear no resemblance to the noxious parasite, as they never make their appearance till other plants have disappeared, and, from their small roots, cannot be supposed to rob the soil of that nourishment which supports their more exalted neighbours. It is certainly desirable to see our garden-walks freed from tufts of green moss, and all available space in our pastures clad with grassy verdure; and it may be no slight benefit conferred on mankind that these are allowed to multiply, and thus call into exercise his skill and ingenuity in extirpating them, and thus, as in the case of the thistle and the briar, turning the primeval curse into a blessing.

Again, there are many Mosses whose natural habitat is the limpid or bubbling rill, "the white cascade" and "mossy fountain's sedgy side," and in these situations they are of

much service in purifying the waters amidst which they vegetate. In such situations also, as well as in other localities, they afford food and lodging to innumerable tribes of insects and molluscs, some of which are rather dainty in their fare, for we are informed by one author of the destruction of a fine set of specimens of the rare *Buxbaumia aphylla* by a slug that had managed to secrete itself in a parcel of these transmitted from the Highlands of Scotland to an English friend. It is scarcely necessary to remind our readers of the service they yield to the feathered tribes and to various quadrupeds, especially such as are dormant during the cold season of the year.

There is one process in the economy of nature to which the agency of Mosses—the genus *Sphagnum* more particularly—lends a most direct aid, and to the consideration of which, on that account, we should perhaps have directed attention before some other matters. I refer to the formation of Peat-moss in the bogs or morasses which occupy a great space in the British Islands, and in other countries in the same or more northern latitudes.

Those who have resided in such districts, at a distance from coal-fields, know how dependent the inhabitants are for their winter supply of fuel on these stores; but how few

Fitch. lith.

V. Brooks imp

reflect that this useful material consisted at one time almost entirely of the delicate stems and leaves of the mosses whose progeny, or rather offshoots, still vegetate on the surface! Yet such is the case, and recent microscopic observation on the structure of coal from beds of that material stored up for so many ages for the use of man incontestably prove that there the delicate *Sphagnum* cushioned the swampy ground, and displayed its glossy fruit. The process is no doubt a very gradual one, varying in this respect according to the species which grow in these bogs, and the climate or length of seasons peculiar to the different countries in which they abound. A very little examination of the superficial layers of such as are in the course of formation, will exhibit the appearances indicated in the succeeding remarks. The formation of the bog is effected primarily by obstruction of streams by the fall of trees, through extensive level tracts, as may be inferred from the remains of those found imbedded in them at various depths. Several species of *Bryum* and *Hypnum* are the preponderating genera at first, or while the water continues to flow lazily along, but as these decay, and thus increase the obstruction, the *Sphagnum*, with its dense spongy foliage, soon makes its appearance and excludes many of its con-

geners. On examination, the first layer of moss exhibits the stems immediately below the surface in a state of very gradual decay, and by tracing these down we find this process going on, thus rendering the peaty substance more and more compact as we descend, until at length, when a depth of forty feet or so has been reached—for some of the Irish bogs attain as much—we find a compact substance charged with bitumen, thus showing its affinity with coal. By these means a supply of valuable fuel is provided for many who would be otherwise very destitute of this necessary of life. Of late years much has been said, and many discussions held even in Parliament, regarding the wonderful properties and valuable constituents of peat, which it is said would afford by various processes almost every domestic comfort. While we fear there may be some exaggeration on this subject, we see no reason why much direct benefit may not be derived from a material so widely diffused in many districts, that lack the productions of more genial and more favoured climes, and thus a boon of no ordinary kind conferred on the poverty-stricken sons of the soil. Our limits will not allow us to enter on the important and much-debated question of these wastes of bog, referring such of our readers as wish to investigate the sub-

ject to the works of Rennie and more recent writers on the subject. One thing is certain, that the climate would be to a great extent improved by the drainage of moss-lands, which would thus in time be rendered arable; and if all the valuable commodities we have mentioned above could not be directly obtained, we are equally certain that in another way—if not so direct—it would yield all these and more to the enterprising landlord and industrious tenant if they set about reclaiming the bleak bogs and moorlands at present solely abandoned to crops of mosses, rushes, and noxious weeds. Nor need we fear that a sufficiency would be left to supply an ample quantity of fuel for those at present dependent on it, as it could be proved that a tenth part of the bulk at present existing in our peat-stores would be more than was requisite for many generations, even with a vastly increased consumption.

Thus briefly have we stated the principal operations of nature in which Mosses are employed, some of which, as we have just seen, contribute ultimately to much of our domestic comfort. We must now dismiss the subject with a few notices of their direct uses, leaving detailed remarks of any kind to be given when we come to speak of genera and species in the body of the work.

At one time the virtues of some of them as remedial agents were much extolled by the medical faculty, but, with the progress of knowledge, these have not been found to stand the test of experience, or others of more repute have taken their place. The arts are but little indebted to Mosses, for, with the exception of colouring matter got from some species, they yield no material that has been found of much service in this way*.

With so many and varied appliances of art and ingenious inventions to keep us comfortable in our easy chairs by day and couches by night, we need scarcely refer to the luxuries of the Laplander's bed of *Polytrichum* and *Sphagnum* moss, which he prepares for himself or his infant charge, and which are so well described by Linnæus in his 'Flora Lapponica.' At times however the botanist, when benighted among the hills, is glad to avail himself of some such material whereon to rest his wearied limbs; and those who may propose to explore our Highland mountains in search of Flora's treasures, would do well to be initiated into the art of heather or moss bed-making, by those who

* Our linen-manufacturers might, we are persuaded, avail themselves of the elegant forms of many Mosses for designing patterns, as has already been done from specimens of the more showy Ferns and Algæ.

have tried the experiment, or to consult the graphic description of a night's lodging in a shepherd's "shieling," given by Mr. Gardiner, of Dundee, in his 'Forfarshire Flora,' that they may know how to proceed if reduced to straits in the midst of such scenes. Had it not been proved that the name of *Hypnum*, signifying "sleep," was at first applied to a lichen or other cryptogamic plant, we could have imagined that the author of the name had bestowed it on the moss after a comfortable nap on a bank of *H. prælongum* or *splendens* some autumn afternoon.

> "He laid him down
> Where purple heath, profusely strewn,
> And throat-wort with its azure bell,
> And moss and thyme his cushion swell."

We have already spoken of the use of Mosses in protecting the roots of plants from the extremes of cold and heat, and other atmospheric changes. Of this the horticulturist has availed himself in several important operations. Thus the success of the process of inarching—a species of grafting—is dependent mainly on the care taken to have a supply of moss judiciously applied at the junction of the scion and stock. Layering also, a mode of striking plants from cutting, is sometimes aided by the application of moss

where the incision is made, from which the roots take their rise. In raising the finer and more delicate seeds, whether in pots or out-of-doors, a layer of moss on the surface of the soil, besides that for drainage below, is found of much service in preserving a suitable degree of moisture and warmth during the process of germination. Finally, the nurseryman is constantly indebted to the various species of *Hypnum* and *Sphagnum* for materials to pack his plants to send to a distance. Those who wish for further information on this head will find satisfactory details in various horticultural publications, and in the 'Rural Cyclopædia,' Art. "Moss."

Other uses of Mosses might be noticed, and we doubt not, as science progresses, the value of these humble tribes will be more distinctly brought out. Enough has been seen, from these few details, to make us unite in saying, with an eminent botanist, "In the economy of man they form but an insignificant part; but in the economy of nature, how vast an end!"

Having thus taken a rapid survey of the ends served in vegetable economy by the Mosses, we shall proceed to notice in separate chapters the leading features of their structure, physiology, fructification, geographical distri-

bution, and classification; only reminding our young readers that they must not be satisfied with the bare perusal of our pages, but at once proceed in their rural walks to collect their objects of study, which may be examined at home, with the aid of a microscope of low power or good pocket-lens, combined with a penknife and pair of scissors. In subsequent chapters we shall give a few short directions for preserving them in the herbarium, and describe the mode we have found successful in cultivating them.

There is no spot on the surface of our globe more highly favoured than the British Isles, in respect of this department of their Flora; and as some of them may be found at all seasons of the year, we may find also in them, in our botanical excursions, a fund of pleasant amusement and instruction wherever we

"Go abroad
Upon the paths of nature, and when all
Its voices whisper, and its silent things
Are breathing the deep beauty of the world.

"Acquaint thyself with God, if thou wouldst taste
His works. Admitted once to his embrace,
Thou shalt perceive that thou wast blind before;
Thine eye shall be instructed and thine heart
Made pure; shalt relish with Divine delight,
Till then unfelt, what hands Divine have wrought."—*Cowper.*

CHAPTER II.

EXTERNAL APPEARANCE AND CONFIGURATION.

"But with a new and sudden birth,
Nature replenishes the earth.
* * * *
As if they heard a voice, and came
Each at the calling of its name."

LIKE other plants, Mosses vary considerably in colour, from white or the palest green to hues of the darkest olive, or almost confirmed brown or black. The former shades are found in *Sphagnum*, some *Dicranums* and *Hypnums*, the latter in the genus *Andreæa*, various species of *Grimmia*, etc. It is the varying shades between these extremes, that give to these lowly plants much of the interest and beauty with which they are invested.

In our introductory remarks, we referred particularly to

the beauty of their form and structure, and we shall now proceed to examine in brief detail the general appearance of the various organs of which they are composed. These, as in more perfect plants, are stems, leaves, roots, etc., which may be traced throughout the whole family, though in several cases their presence is with difficulty detected.

Commencing with the *Roots*, we have previously remarked that these are in general very small and microscopic; those with the strongest being some of the largest *Bryums*, growing on the ground, and those with the smallest, the various minute *Hypnums*, or other genera with trailing stems of a similar habit. In *Orthotrichum*, and some others growing exclusively on rocks or trees, the root is often a mere flattened disc for the purpose of attaching the plant to its resting-place, while its nourishment is derived principally from the atmosphere. The number of roots in some genera and species makes up for their minuteness, as in *Bartramia arcuata*, where the brown masses of root—or what is supposed to be so—sometimes become so luxuriant as to smother entirely the stems and foliage. As may be expected, some of the trailing species make roots readily at each joint of the stem, while others, of which *Hookeria lucens* is an example, emit rootlets from every point of their

substance, such as the edges and surface of their leaves. There is no instance in which straight or tap roots are produced, though the primary and secondary can be distinguished in some cases. The roots of Mosses, as we have already seen, are the chief origin of the soil formed in peat-bogs and other localities in which they abound, and thus they perform an important part in the economy of nature.

In no particular do Mosses present us with a greater variety, than in the length, direction, and form of their *stems* and *branches*, for while some grow to the extent of several feet, others seem to be entirely destitute of any trace of a stem, leaving the fruit-stalk rising almost directly from the disc or root. Again, if we look at the *direction* they take, we find the *Hypnums*, with various allied genera, branching out more or less irregularly on banks, trees, or rivulets. Others, as the genus *Orthotrichum*, send out numerous branches from a common centre, some of its stems being erect, while others spread around at various angles, and make a nice semicircular cushion or tuft; while a third class, comprising a great many genera with very short stems, grow in extensive patches on the ground and wall-tops, each individual made up of its simple rootlets, stem, and fruit-stalk.

In *form* the stems are mostly rounded, though they vary in different genera, and this diversity depends in a great measure on the form and consistence of the leaves, which are often closely adpressed to, or arranged in particular order round, the stem.

The terms used in describing the stems and foliage of higher plants, are equally applicable to those of Mosses, and therefore some previous acquaintance with a Botanical Glossary is a useful preliminary to their study.

We now proceed to say a few words on the FOLIAGE of Mosses. Though the *Buxbaumia aphylla*, or leafless *Buxbaumia*, from its specific name may seem to be an exception, there are no true Mosses without distinct leaves, for even in this curious plant Brown discovered, at the base of the foot-stalk, minute leaves, seemingly composed of fine shreds. As in higher plants we have different classes of leaves, so here we find a variety according to the station they occupy on the plant: these are known to Muscologists as cauline and perichætial, or those clothing the stem and those immediately surrounding the base of the fruit-stalk or seed-vessel.

They differ however in some very important particulars from the leaves of other vegetable tribes, and it may be well

to view them in contrast with these, in order to give beginners some general idea of their form and structure.

In the first place, then, the leaves of Mosses are in every case destitute of a footstalk—an appendage so frequently met with among higher forms—but are attached to the stem by the lower edge, sometimes also folding over and clasping by the sides, thus rendering them imbricated, decurrent, etc. Unlike those of other plants, they are always simple and undivided, the only irregularity at the margins being more or less distinct serratures, which are sometimes thickened, and afford characters for distinction of species. The next particular in which we may note a peculiarity, is the absence of anything approaching to hairiness or pubescence on the surface. To the inexperienced there are many seeming exceptions to this rule, as some *Trichostomums* and *Grimmias* seem more like downy cushions than anything else: on closer examination, these hairs will be found to prove the elongated bristle with which every little leaf is tipped; the rootlets springing from the stems and leaf-margins of several species, are also appearances apt to mislead. The fourth and last distinguishing mark worthy of notice, is the persistent character of Moss-leaves,—that is, they do not decay and fall off like the leaves of trees and other plants

with which we are familiar: for this we might be prepared by the simplicity of their structure, and we find that in decaying, there is often a degree of roughness produced on the stems by the midrib surviving the decay of the expanded portion of the leaf.

A *nerve* or supporting midrib is very common in the leaves of Mosses, and sometimes there are two arising from a common centre. They vary much in length, thickness, direction, etc., and important specific characters are afforded by these variations.

No external apertures resembling the stomata or breathing apparatus of more perfect plants have been observed on the leaves, though doubtless some such provision must exist to enable them to absorb moisture so easily as they do, after being dried. This property of reviving under the application of moisture, is one of much importance to the collector, who may not be able to examine his specimens as soon as they are gathered, or may receive them from a distance, for though months and years may elapse, they will at once, when moistened, assume their original form, though the tints in most are apt to fade considerably*.

* It is proper to mention here, that such as are submitted to very great pressure in order to make fine specimens, do not so readily revive.

Müller, in the 'Botanical Gazette,' has suggested a very simple plan of preserving the leaves of Mosses and similar plants, especially such as are adapted for microscopic observation,—between thin plates of talc, which may be immersed in water without injury. A short description of this mode of preservation will be found in the Appendix.

CHAPTER III.

INTERNAL STRUCTURE.

"There, to charm the curious eye,
A host of hidden treasures lie,
A microscopic world, that tells,
That not alone in trees and flowers
The spirit bright of beauty dwells,
That not alone in lofty bowers
The mighty hand of God is seen,
But more triumphant still in things men count as mean."

NEITHER space nor the popular character of this treatise permit of our dwelling minutely on this branch of the subject. Holding however, as we do, that anatomical research into the structure and observation of the phenomena of life in these minute vegetables is by no means

beyond the reach of the youthful student, and is a most interesting branch of study, we will, in as few sentences as possible, state some of the most interesting facts recorded and observations made, by those Botanists who have most carefully studied this branch of Muscology. All who have studied the internal structure of more perfect plants, know that the compound organs, as they are called,—leaves stems, roots, etc.,—are made up of what are named "Elementary Tissues," divided into two great sections, the cellular and vascular, as they consist either of minute cells or vessels. As may well be imagined, they vary much in form, size, and quantity. The latter are found only in the more perfect plants; and as these descend in the scale, we find—as in the case of Ferns—the vascular tissue decreasing, till, when we reach the Mosses, all the organs are formed of minute cells. Such is the case, for though Hedwig, the celebrated German Muscologist, reasoning from analogy and various phenomena, supposed they existed in various organs, the most recent microscopic researches only confirm the facts regarding the entire absence of tubular vessels. The want of these however is amply compensated by the varied form, delicacy, and absorbent properties of the cells, which even to the naked eye are objects well cal-

Fitch lith.

V. Brooks imp.

culated to draw forth our admiration and invite us to their study.

In the stems and leaf-veins they are, from the pressure from within, of a lengthened form, resembling the tubes found in the wood of trees; while in the expanded portion of the leaf they assume many shapes, being round, oblong, and variously angled; and these forms are so constant in each species, that specific characters may in many instances be deduced from them.

From the densest portion of the stem being that which is external, a similarity may be traced between Mosses and Palms, while, from their extensive ramification, and otherwise complicated forms, they seem to bear considerable analogy to plants of a higher order.

In *Sphagnum* and some other genera, the cells are traversed by bars in various directions, which render them beautiful objects for the microscope, and they are doubtless of importance in the economy of the plant*.

* Recent authors of works on Mosses have made use of characters taken from the structure of the cellular tissue, for forming subdivisions of genera.

CHAPTER IV.

FRUCTIFICATION.

"By the brightest cups on the emerald moss,
Whose fairy goblets the turf emboss."

Among "flowering plants," the flower and fruit, or, to speak scientifically, the Reproductive organs, are regarded as a most important, as well as a very interesting, branch of botanical study. It is no less so throughout the large families of *Cryptogamia*, and among these the Mosses yield to none in the beauty, elegance, and interest of their fructification.

True, if we except the red and yellow heads of some foreign species of *Splachnum*, we have little brilliancy of hue to attract the gaze of the general observer. We have

here none of the "unnumbered dyes" of the gaudy tulip, the odour and brilliant hues of Flora's queen, the rose, and little approaching the ruby and gold tints of our summer and autumn fruits; but who that has searched in winter or early spring the wall-top, woodland, or rocky height, after our tiny favourites, will say that these more conspicuous vegetable beauties eclipse the graceful and polished urn of *Polytrichum* and *Bryum*, the grooved and apple-shaped capsule of *Bartramia*, and the scarlet-fringed seed-vessel of *Grimmia* and *Dicranum?*

In speaking of the stems and foliage of Mosses, we mentioned that there were some important particulars in which these differed from corresponding parts in flowering plants, and the same remark may be made regarding their fruit and seeds. In the former the stamens and pistils—or male and female organs—with the accessory parts, are more or less easily distinguished; and subsequently to the period of flowering, the seed-vessel, with its divisions and coats, can be readily separated and examined. It is different when we come to examine these or analogous parts among Mosses, as they are in most cases minute, and in a young state especially not very obvious, even to the practised eye, from being concealed in buds or similar receptacles.

The nature and extent of the present work will not permit of our entering into minute descriptions of any of these obscure parts, of detailing the investigations of muscologists, or of discussing the various opinions regarding the processes by which the seeds or buds are matured. Before however proceeding to examine the structure of the capsule or theca—popularly and justly regarded as the most important part of the fruit of a Moss—we must say a few words on objects of another description, intimately connected with the propagation of species, though their functions are obscure, and have been a source of much discussion among those who have devoted their attention to such intricate investigations. These are the *gemmæ*, or buds, of which the star-shaped bodies, which appear in great numbers at certain seasons on the summit of the branches of various species of mosses, are examples. While in most instances they are so minute as to attract little attention, there are some species in which they are so distinct and beautiful as to be objects of interest to the most casual observer. Such are the forms found on various species of *Polytrichum* on wall-tops, moors, etc., visible at considerable distances by the brilliancy of their tints. In *Bryum*, *Bartramia*, and other genera, similar bodies are found, presenting a dark-coloured velvety mass

surrounded in a circular manner by leaves larger and different in form from those of the stem. These leaves may be regarded of similar service in protecting the buds enclosed, as the perichætial leaves—of which mention has been made above—for the young capsule. Those who are in possession of a suitable microscope, and have patience to dissect and examine these minute bodies, will, according to the species selected, find one or other of the following objects:—

1. Minute oblong bodies, of a reticulated or netted texture, and of a rounded form. They are supported on a short footstalk, somewhat resembling the filament of the anther in more perfect plants, and from this circumstance, as well as from their discharging a granular pellucid substance resembling some sort of pollen, they have been called *antheridia*.

2. What have been regarded as female flowers or pistils, are also bodies of a linear or oblong form, swollen at the base, and with the upper portion resembling the style and stigma in flowering plants; they have been named *pistillidia*.

3. With these two kinds of bodies are mixed up a number of minute jointed filaments of smaller size and simpler construction, named by Hedwig, who paid much

attention to this branch of Muscology,- *fila succulenta*, succulent threads. They vary in form, but are in general jointed filaments like some of the lower Fungi or moulds. Recent writers on Muscology designate them *paraphyses*, and the minute *Vibrio* has been detected in some of them*.

As has already been said, there seems no good reason to suppose that, notwithstanding some degree of resemblance, these bodies perform the same functions as the reproductive organs of more perfect plants. They are well worthy of examination by the youthful muscologist, and those who intend to study the anatomy, physiology, or classification of the family, must investigate them with care, as it is probable that the classification of future works on Mosses will be founded in a great measure on the structure of these minute organs, as has already been done in the valuable 'Muscologia Europæa' of Bruch and Schimper, and Müller's Synopsis.

With these brief remarks on the gemmæ, we proceed to examine the Capsule, Theca, or Seed-vessel of a Moss, familiar to all in country walks, especially throughout the winter months.

* The small powdery masses found on the tips of the leaves of *Tetraphis* and various *Jungermanniæ*, are of quite another nature.

By referring to a preceding paragraph in this chapter, the reader will find that what is called the female flower in the bud, has been compared to the pistil of the more perfect plants. It is one or more of these that is developed into the capsule, but the way in which this is done shows that there is no proper analogy between the two: among flowering plants, the *germen* or lowest part becomes the seed-vessel, whereas in Mosses it is the summit or apex that swells and becomes the receptacle for the seeds or spores. Those *pistillidia* that are to form the future capsules, as they advance in growth, become covered with a thin transparent membrane, beneath which a stem—the young seta—is seen to be developed, and the germen or capsule gradually swells and is pushed up on the summit. As this process goes on, the membrane separates transversely, the lower part decaying, and the upper adhering to the young capsule, to which it remains attached till the capsule is more or less matured, when it is known as the *calyptra*, or veil.

Let us now examine a little in detail this beautiful object—the perfect capsule with its accessory parts, proceeding upwards. Though not very evident in many instances, it is, with few exceptions, supported on a pedicel or footstalk, called the seta, from the side or summit of the branches,

forming a natural division into lateral and terminal fruited genera*.

The seta is circular, more or less smooth on the surface, and of firm consistence, to support the weight of the capsule. Crowning the summit of the seta is the capsule itself, though there are some genera and species in which we find an intermediate body—the struma or apophysis—resembling in form, but more solid than the capsule; and though its use in the economy of the plant cannot be well guessed at, it is, as in the genus *Splachnum*, of importance in framing specific distinctions.

The capsule itself varies in size, form, and consistence, and is composed externally and internally of different parts. In some genera it is large in proportion to the other parts of the plant, while in a great many it is minute and inconspicuous. Its direction varies much, from perfectly upright to all degrees of inclination, in different genera. When mature the capsules of some species of *Grimmia* bury themselves among the foliage, probably a provision of nature to

* Dr. Lankester, in the 'Annals of Natural History,' vol. iv. p. 362, has described the curious hygroscopical properties of the seta of *Tetraplodon hygrometrica*, which turns from right to left or left to right, according as it is moistened at the top or bottom. This doubtless arises from the nature of the lengthened spiral cells.

assist the ripening of the spores, as we find certain aquatic plants doing under water. The shape of the capsule, in the great majority of cases, is ovate or oblong, though in some genera, such as *Bartramia* and *Phascum*, it is always spherical; in *Tortula* much elongated; in *Funaria* pyriform or pear-shaped; in *Polytrichum*, especially when ripe, quadrangular, and so on. The surface is smooth in general, though there are many instances in which it is striated, furrowed, and dotted in various ways. As might be expected, those species more exposed to vicissitudes of the weather, and whose seeds are long in attaining maturity, have capsules of a horny or cartilaginous substance, while the *Hypna* and other genera growing in woods or on shady banks, have them of a much slighter fabric.

In the interior of the capsule is found the *columella*, a small projecting thread, varying in form, and often very evanescent, to which the spores seem to be attached in a young state. The capsule is also lined with an inner membrane, for the greater defence of the spores, from which, or from the columella, a flat circular lid or membrane is frequently produced at the mouth of the capsule.

This brings us to the external fringe or peristome, the beautiful and delicate appendage prepared by nature for the

protection of the spores after the lid has dropped, and for their subsequent dispersion when thoroughly mature. That this is the purpose it is mainly intended to promote, is evident from its marked hygrometric properties, as it expands freely when the air is dry and warm, and as surely closes whenever the atmosphere is charged with moisture. The simple experiment of breathing on one of those of the larger species, especially if the lid has but recently fallen off, will well illustrate this fact. Even to the naked eye there are few portions of the structure of Mosses, or indeed of any other cryptogamic plants, that are more worthy our notice and admiration; but it is when examined by a low microscopic power that its beautiful structure is fully disclosed. The number of divisions or segments of which it consists is very regular, and thus useful characters for distinguishing genera have been drawn from it. The segments are four, or multiplicates of that number—8, 16, 32, and 64, none being intermediate. While pale yellow is the leading colour of the peristome, we find some variety in this respect, some being almost black and others brilliant crimson. In some genera we find a double peristome, the inner one being of a more delicate texture and paler in colour, arising from the inner membrane of the capsule. Some *Hypnums* and

other genera have also, in addition to this, a series of fine threads intermingled, which have afforded characters for separating the tribes of this extensive genus*.

Covering the capsule till it has reached the necessary stage of maturity, we find the *operculum*, or lid, a cup- or cone-shaped body, present in all the leading genera. When it has performed its function it falls off, allowing the peristome to perform its office in dispersing the spores. *Andræa*, *Phascum*, etc., as will be seen in the Classification, have no operculum.

The last portion of the fruit of Mosses we have to describe is the *calyptra*, or veil. In the preliminary remarks it will be remembered that when this covering membrane is first discovered it is seen to envelope completely the *antheridia*, or young fruit-stalks. As these increase in height, the membrane, being divided transversely, is pushed up by them, and assumes gradually the form characteristic of the species. The calyptra in some genera, *Sphagnum*, etc., is very fugacious, so cannot be detected in such, unless the fruit is examined in a very young state.

* The genus *Gymnostomum*—Beardless Moss—and some of its congeners, are distinguished by being destitute of a peristome, though in many of these there is an annular ring present, which may be of service in the economy of the plant.

Two forms are found to prevail throughout the different genera, viz. the mitriform and dimidiate, the first resembling the extinguisher of a candle, and well represented by the *Encalypta,* or Extinguisher Moss, and the other a wide lateral slit or division, which makes it more readily fall off as the capsule increases in size. From its character important generic and specific distinctions are derived.

In general the calyptra is smooth, though we find some of the mitriform genera furnished with furrows and long hairs. In some *Polytrichums* the calyptra is double, the interior being of a delicate membranous substance, and the exterior of a loose shaggy texture.

CHAPTER V.

SEEDS OF MOSSES.

"Seeds to our eye invisible will find
On the rude rock the bed that fits their kind:
There in the rugged soil they safely dwell,
Till showers and snows the subtle atoms swell,
And spread the enduring foliage."

LET us again lift the lid of this neat little box, and examine the nature of the fine green powder we see imbedded in it. This is the mass of seeds or spores, which under a high power of the microscope are found to be beautiful objects. As in the higher plants, we find that the minute species, such as *Phascum*, have larger seeds than those of greater size. In most Mosses the spores are spherical or approaching to it. The surface also of most is smooth, though there

are instances in which they are found to be angular; in the Extinguisher Moss they are marked with circular depressions, while in others they are rough in their nature. We find on examination they are widely different from true seeds of the higher plants, as they "have no integument or embryo, consequently no radicle or plumule. The sporule is in itself a homogeneous substance, producing indifferently from its surface, roots and stems." An ingenious writer on Mosses, De Beauvois, maintained that the green powder in the body of the capsule was pollen, and that the true seeds were to be found attached to the columella,—a theory ably refuted by Mr. Brown in vol. x. of the 'Linnæan Transactions.'

Our readers are all familiar with the germination of the bean or other large seed, which have attached above or below ground two fleshy bodies, known to botanists as the *cotyledons*. These contain the supply of nourishment necessary to maintain in life the plant till the root has sufficient vigour to draw its food from the soil, when they disappear. In the phenomena that take place during the development of the young Moss, we will see a marked difference in the two cases.

Meese and Hedwig—especially the latter—towards the

close of the eighteenth century, were the first who made the experiment of raising Mosses from their sporules; but we cannot do more at present than briefly record a few of the leading facts brought out by their interesting investigations, and those of more recent muscologists. Hedwig's first experiment was with the sporules of a very common Moss—the *Funaria hygrometrica*. He detached from the capsule, and scattered in a flower-pot, on such soil as was favourable to their growth, some of the sporules of this Moss, which in a day or two assumed a darker hue, and on the seventh day a green mass was found to cover the surface of the pot. On taking a very small portion of this, cleansing it in water, and subjecting it to a high power of the microscope, it was found to consist of the germinating sporules, presenting at one point minute white roots, and at the other simple obtuse projections of light green, the origin of the young plant. These in three days more had become branched, the latter resembling the jointed filaments of a Conferva, and attained considerable length, giving the surface of the pot the covering of rich green velvet so well known on damp walls and in other moist situations. In some weeks the young leaves made their appearance, and in due time perfect capsules were obtained, from which to

raise a new generation. The details of this interesting experiment, and of others made by the intelligent Drummond, will be found in the 'Edinburgh Encyclopædia,' vol. xv., Article "Musci," and in the thirteenth volume of the 'Linnæan Transactions,' p. 24.

That these conferva-like shoots are of a different nature from true cotyledons—as they were termed by Hedwig—was proved by Drummond's experiment of removing a portion of the green covering from a flower-pot, and finding that if he did not go too deep in doing so, this covering was renewed by new growths from the part of the plant underground. The length of time in which the plant remains in this conferva state varies much in different Mosses. In *Funaria, Gymnostomum pyriforme,* and some *Brya,* leaves are produced in about three weeks from the time of sowing, if moisture is duly supplied, while in some *Polytrichums* they do not appear for two or four months.

Drummond also informs us that "the duration of the green part of the conferva-like filaments on the surface, after the Mosses produce their true leaves, depends much on the soil and situation in which they grow. In *Phascum serratum* and *Polytrichum aloides,* they are almost always present; and in some Mosses supposed to be annual I have

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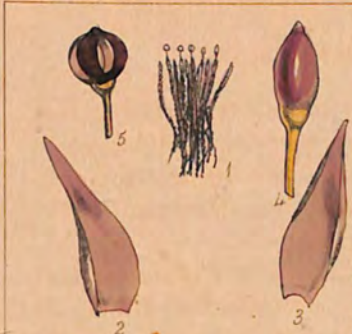


Andræa rupestris.

Anomodon curtipendulum.

Anictangium ciliatum.

found them remain, and throw up plants in succession for several years."

From the wide dissemination of the sporules it is amazing with what rapidity some species of Mosses in favourable circumstances cover the wall-tops, garden-walks, and lawns; and the gardener knows to his cost that no little labour is required to eradicate such from their favourite localities. We observe, in a recent number of the 'Gardeners' Chronicle,' the description of a machine used at Trentham Hall Gardens, in Staffordshire, for killing such "pests" on garden-walks, by applying to them once a year a copious supply of hot water strongly impregnated with salt.

It may seem inconsistent with the above to recommend Mosses as objects of cultivation; but while we grant that in situations such as we have indicated, they are injurious weeds, we nevertheless should be glad to see some of the most tractable cultivated in pots or other receptacles, for the beauty of their foliage and fruit. Most readers must have seen the agreeable effect they produce on the surface of flower-pots, or in baskets in which the *Orchideæ* of tropical climates are grown.

Their cultivation may be effected by lifting with a little care, towards the end of the season, a good tuft of the

species it is desired to grow, and putting in a medium-sized flower-pot. A greater proportion of drainage should be given than for other plants, and the tuft should be placed in immediate connection with such material as most nearly resembles that on which the moss grows naturally. If a trial be made of such as grow on rocks, shores, or branches of trees, and some of these succeed very well, they should be for a time secured to these by a piece of string or some other contrivance. Those which like moisture, such as *Bartramia fontana, Hypnum cordifolium,* and *Dicranum squarrosum,* should have the pots placed in saucers filled constantly with water, by which means they are supplied regularly with moisture. A cold frame, or shaded shelf of a cool greenhouse, does very well for them to stand in while in a growing state, and at this season such should each day have a watering with a fine-rosed pan, regulating the supply according to the degree of moisture in the surrounding atmosphere. During summer, which is a period of repose to most species, and when they are cast into the shade by the more brilliant tints of flowering plants, the pots may be placed under any shaded wall, taking the weather as it comes. The only precaution necessary at this time is to cover the assemblage of pots with some garden-netting, to

prevent the birds picking up the tufts, which they are very ready to do in search of insects and worms.

The following is a list of such species as we have found succeed most readily, and which are easily obtained, and those who may wish to prosecute the subject will find further instructions in an article in the 'Cottage Gardener.'

Andræa rupestris.
Anictangium ciliatum.
Anomodon viticulosum.
Bartramia pomiformis.
Bryum punctatum.
—— pyriforme.
—— rostratum.
—— argenteum.
Cinclidotus fontinaloides.
Dicranum bryoides.
—— pellucidum.
—— squarrosum.
—— taxifolium.
Didymodon heteromallum.
Didymodon trifarium.
Encalypta vulgaris.
Grimmia apocarpa.
—— leucophæa.
Gymnostomum fasciculare.
—— ovatum
—— pyriforme.
—— truncatulum.
Hedwigia æstiva.
Hookeria lucens
Hypnum cordifolium.
—— cupressiforme.
—— dendroides.
—— molluscum.
Hypnum plumosum.
—— trichomanoides.
Orthotrichum anomalum.
—— Hutchisiæ.
—— rupincola.
Polytrichum alpinum.
—— juniperinum.
—— undulatum.
Tortula cuervis.
—— subulata.
Trichostomum aciculare.
—— heterostichum.
Weissia contraversa.
—— curvirostra.

CHAPTER VI.

GEOGRAPHICAL DISTRIBUTION.

"Do not depreciate any pursuit which leads men to contemplate the works of their Creator. The Linnæan traveller, who, when you look over the pages of his journal, seems to you a mere botanist, has in his pursuit, as you have in yours, an object that occupies his time and fills his mind, and satisfies his heart. It is as innocent as yours, and as disinterested,—perhaps more so, because it is not so ambitious. Nor is the pleasure which he takes in investigating the structure of a plant less pure, or less worthy, than that which you derive from perusing the noblest productions of human genius."—*Southey.*

We have in the Introductory Chapter taken notice of the great proportion of space occupied by the Mosses in the temperate and colder zones of the earth, finding that they abound to such an extent as to eradicate, in many instances, the grasses and other plants amid which they grow. In general, wherever moisture and shade is afforded, we find

one or another species, according to the season of the year, or the nature of the soil, or other material on which they thrive. With reference to this latter point there is considerable variety among Mosses, though not so much as we find among higher plants. Some species prefer clay, and others peat; one genus affects sandstone, and another calcareous rocks, while several are found chiefly on particular species of trees. Mr. Spruce, in his interesting paper on the "Mosses of Teesdale," published in the Transactions of the Botanical Society of Edinburgh, observed however that in that district "very few of the Mosses were absolutely confined" to either the basaltic or limestone cliffs of which it is composed. In speaking of the varied localities in which particular genera or species are found, Drs. Hooker and Taylor, in the preface to their interesting 'Muscologia Britannica,' make the following remarks:—"One curious little plant is found only on the perpendicular faces of the pure white chalk-pits that abound so much in Kent and Sussex. Some are confined to granite, some to calcareous rocks; one species, the *Funaria hygrometrica*, a moss that grows in all parts of the world, is almost sure to spring up where anything has been burned upon the ground, and particularly where charcoal has been made, whence its French

name, La Charbonnière. Some are never found but upon the dung of animals, of oxen, and particularly of foxes; this is the case with most of the species of the genus *Splachnum*. One of these, the *S. angustatum*, which is commonly met with upon dung, we once saw growing vigorously upon the foot of an old stocking near the summit of Ingleborough, Yorkshire; the same species was found by a friend of ours, covering the half-decayed hat of a traveller who had perished on the mountain of St. Bernard in Switzerland; and the same, if we mistake not, was discovered by Captain Parry in Melville Island, vegetating in the bleached skull of a musk-ox." We might detail further their varied localities, but shall have more scope for this when we reach the description of species. In these instances we see in how many ways the Creator of all can make the minutest objects minister directly or indirectly to the promotion of his plans of wisdom and beneficence.

> "Nature boon
> Pour'd forth profuse on hill and dale and plain,
> Both where the morning sun first warmly smote
> The open field, and where the unpierced shade
> Imbrown'd the noontide hours."

But it is not so much of the "habitats" of Mosses we

would desire to speak at present, as of their *geographical distribution* throughout our own and other lands. As we shall in the body of the work have occasion to refer to the range of the localities of those that are natives of Britain, we shall in the remainder of this chapter confine ourselves to a few observations on the dissemination of this interesting family in the other quarters of the globe.

Meyen, in his 'Botanical Geography,' says that "the wide range of the Cryptogamia, particularly of lichens and mosses, is sufficiently known; indeed many of them seem to be distributed uninterruptedly from one end of the earth to another."

While there is thus scarcely any portion of the earth destitute of Mosses, it is, as we have already observed, in the temperate and colder zones where they most abound.

Those who have ascended some of our loftier Scotch mountains must have observed the immense fields of *Trichostomum lanuginosum* matting the ground, looking still more grey and sombre than is their wont from the snow-wreaths by which they are frequently accompanied even at midsummer. An excess of heat seems unfavourable to the growth of Mosses, for under the equator we find but very few species, the luxuriant herbage and "bush" entirely oc-

cupying the ground, and the giant trees, instead of being enveloped in warm coats of *Hypnum* as in colder latitudes, clad with the light and tangled vesture afforded by the *Orchideæ* and other gaudy epiphytes or parasites. There is however one exception to this rule in the *Octoblepharum albidum*, a beautiful white moss—frequently brought home even by unscientific collectors—which invests the stems and branches of cocoa-nut and other trees beneath the Torrid zone. "Others, of still more uncommon occurrence, are gathered on the burning sands of the deserts in the interior of Southern Africa."

As we proceed northwards or southwards from the Line, we find the proportion of mosses and the lower cryptogamics increase, till we reach such latitudes as are represented by the British Isles, where, as has already been noticed, from our climate and formation of the land being favourable to their growth, a greater variety is found than in any other country of similar extent. Within the Polar Circle, accompanied by lichens, they are almost the only vegetable production; their variety also is so great, that "Crantz, a celebrated traveller in that barren country, says he had counted above twenty species without rising from the rock on which he was sitting." Martens, another

traveller, informs us that in Spitzbergen "the rocks of schistus rising out of the mass of everlasting ice are thickly clothed with mosses."

Such is the covering afforded to the frozen soil during the short summer in these dreary wastes. The scene recalls to our recollection a passage in Darwin's 'Loves of the Plants,' in which some verdant *Muscus* is represented addressing the ruddy-complexioned *Cœnomyce*:—

"Awake, my love, enamour'd Muscus cries,
Stretch thy fair limbs, refulgent maid, arise;
Ope thy sweet eye-lids to the rising ray.
* * * * * * *
Down the white hills dissolving torrents pour,
Green springs the turf, and purple blows the flower;
His torpid wing the rail exulting tries,
Mounts the soft gale, and wantons in the skies;
Rise, let us mark how bloom the awaken'd groves,
And 'mid the banks of roses hide our loves."

But a small proportion of the species from these regions are found in fructification,—a circumstance, as Dr. Hooker remarks, which "gives additional force to the argument that what we consider the seeds of these plants, are by no means necessary for their increase."

Here we may remark that Mosses are subject, in their distribution, to the same law that regulates plants of a

higher organization, with reference to their altitudinal range on mountains, as we find that the species or forms of colder climates gradually appear as we ascend the mountains in tropical countries; and in Britain we find that the species abounding within the polar circle are found on the summit of our Scottish mountains, though but of moderate height. Jamaica, for instance, is an island on the lowlands of which very few mosses have been found, while on its Blue Mountains Swartz found a great variety, differing in many respects, as might be expected, from the European flora.

While however we have the individuals more numerous, there is by no means such a diversity of form among Mosses as among plants higher in the scale. This will easily be understood when we consider the small proportion they bear in statistical tables; and to illustrate this fact we may mention that there are but a very few species natives of Britain that have not been detected on the continent of Europe, and *vice versâ*. What is still more singular is the fact that the great continent of North America, especially in the corresponding parallels of latitude—so much further removed from us—contains a muscal flora still more resembling that of the British Isles. Those who have examined the collections made by the lamented Drummond,

or who have perused the Botanical Appendix to Sir John Franklin's Voyage to the Polar Sea, will find a great analogy between the Mosses of that country and our own.

In Asia are found, besides many new genera and species, a large number of species well known in Europe, thus showing their simplicity of structure and their capability of adapting themselves to change of climate and vicissitudes of temperature. As might be expected, when we transport ourselves to the distant islands and continents of the southern hemisphere, tenanted and clad by so many curious forms, we find a greater diversity in this, as well as the other departments of botanical science. Not to mention the riches of the humid districts of Patagonia, whence Dillenius received many fine species, what an interesting addition was made to science by the discoveries of Menzies in New Zealand! while in New Holland and Van Diemen's Land the cryptogamic flora, including the Mosses, is, like its fauna, singular and peculiar, presenting genera and species analogous in many respects to those of the Old World, but yet with some peculiarity of structure rendering them quite unique. For instance, in New Holland "we have, instead of *Polytricha*, a singular Moss—*Dawsonia polytrichoides;* instead of the usual forms of *Gymnostomum*, we have those

peculiar Mosses with a gibbous capsule, a membrane across the mouth, and a very peculiar habit, of which Dr. Brown has formed his genus *Leptostomum*." For further particulars on this subject we refer our readers to Dr. Brown's admirable work on the flora of New Holland; and those who do not wish to drink too deep, will find an agreeable draught of more moderate dimensions in the 'Encyclopædia Edinensis,' Art. "Musci," p. 6.

To advert again to our own flora, it is gratifying to see that this branch of botanical science is engaging the careful and assiduous attention of botanists. This is proved by the labours of Hewitt, Watson, Professor E. Forbes, and still more recently by those of Professor Dickie of Belfast, a well-known and successful student of Cryptogamia, whose papers on the altitudinal range of Mosses in Aberdeenshire, etc., recorded in the transactions of the Botanical Society and British Association, show that there is much to interest the muscologist were he to follow in their steps. We conclude this chapter with a few statistics, which may show the reader the proportion the Mosses bear to other families of plants.

Müller, in a "synoptical table" appended to his 'Synopsis' published in 1851, calculates the number of species

of Mosses discovered at that date to be 2300, of which 473 are described for the first time in his work. Previous to this but a few years, Lindley calculated the number of species at 1100, and of genera at 46, which shows how much attention has been paid to the investigation of these minute plants.

CHAPTER VII.

CLASSIFICATION OF MOSSES.

"Those who have leisure, opportunity, and abilities to contemplate and consider any of these creatures, if they do it not, do, as it were, rob God of some part of his glory in neglecting or slighting so eminent a subject of it, and wherein they might have discovered so much art, wisdom, and contrivance."

TRUSTING that our readers have, from preceding chapters and some personal examination of the structure of a Moss, got such an amount of information as will enable them to discover for themselves, with the aid of the descriptive portion of the work, the names of the more common species that are observed in their country walks or botanical rambles, we intend forthwith to enumerate in the succeeding pages the genera and species of this interesting family, recognized as natives of the British Isles.

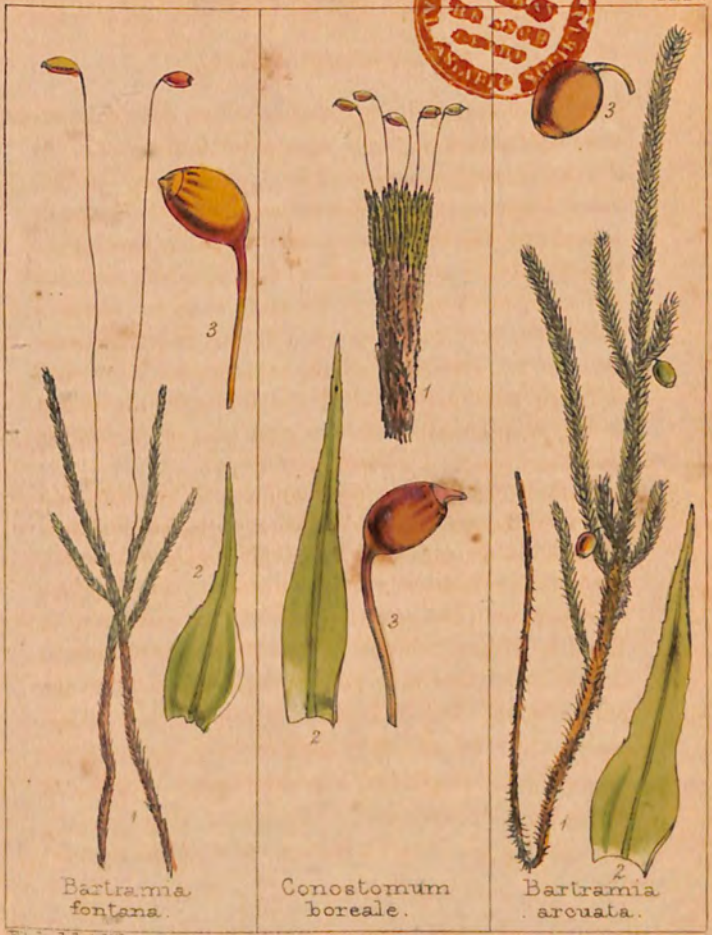
It will be well however to devote a few pages to the important subject of Classification, that a good groundwork may be laid for prosecuting accurately the research necessary with such minute objects. Thanks to those who have preceded us, this, with a little care and patience, will not prove such a formidable task as a beginner might imagine.

We find that there are 39 genera and 300 species recorded in Hooker's 'Flora' as natives of Britain, to which many have since been added; and with such a host to arrange, it is of much importance that the principles on which their orders and tribes are classified, should be well understood and accurately defined. Before the publication of the 'Historia Muscorum,' by Dillenius, the celebrated British muscologist, the Moss family in scientific works was associated with a heterogeneous mass of Lichens, Algæ, and Fungi, and even in *his* book many of the two former are described. This we are prepared to expect from his wide definition of a Moss—"a class of inferior plants, consisting of parts simple or uniform, or endowed with diversity of parts." The following six genera, comprising the true Mosses, having "fructification visible in powdery heads," were instituted by him, viz. *Mnium, Sphagnum, Fontinalis, Hypnum, Bryum, Polytrichum.* Linnæus followed him, adding some new genera; but his system was still very defective, as

he included among Mosses the *Lycopodium*, now representing a distinct natural family more allied to the Ferns, and *Porella*, a foreign genus allied to *Jungermannia*. He followed Dillenius in mistaking the capsule for the anther or male flower, and also in describing erroneously many of the genera. As the great naturalist however scarcely ever used a lens—of which in some of his works he seems to make a boast—we need not be surprised to find grievous inaccuracies in his descriptions of the Cryptogamia. We shall see, as we proceed, that little can be done in this department of botany without the aid of a good lens, or, if deep research is aimed at, a powerful microscope.

Saussure, Haller, and other continental botanists, had however been studying the characters of the fruit and peristome of Mosses, and in due time Hedwig gave to the world, among other interesting contributions to muscology, his 'Groundwork (Fundamentum) of the Natural History of Frondose Mosses,' in which the modifications of form in the peristome hold an important place. He followed the principles laid down by Linnæus in his 'Philosophia Botanica,' that "the characters must all be derived from the number, form, proportion, and situation of the whole of the organs of fructification."

Improving on Micheli's discovery of what are regarded



Bartramia fontana.

Conostomum boreale.

Bartramia arcuata.

by some the sexual parts of Mosses, he adopted the "male" flowers for the subdivision of his classes, as these were found in the form of a disc, knob, or bud. These "male" flowers, we have seen, are observable by the naked eye in but comparatively few Mosses; and British botanists—we refer especially to the system of Hooker—have rejected subdivisions founded on their position and structure, as adopted by Hedwig and succeeding continental botanists; judging that the capsule and its parts were quite sufficient for distinguishing the several orders and genera.

Bridel, a German botanist, published in 1819 his 'Methodus nova Muscorum,' an ingenious system, founded also on the structure of the capsule and portions of the peristome. The principal objection to it is the minute way in which it is subdivided, and encumbered with hard Greek names, involving a task on the memory which a muscologist nowadays can ill afford to submit to. His 'Bryologia' however displays great labour and research, and those who have studied his works much more minutely than the author of this volume, say that these, "though full of the strangest errors as to species and synonyms, contain a history of the science, and a review of whatever is connected with it, at once admirable and unrivalled."

We can only refer in passing to the labours, in this department, of two of our most distinguished countrymen, Drs. Greville and Arnott. These were brought to light in "A new arrangement of the genera of Mosses," published in 1824 in the fourth and following volumes of the Transactions of the Wernerian Society, and accompanied by most interesting information regarding some obscure genera.

Let us now pass on to the method of classification employed in what may be regarded our standard authorities in British Muscology—the 'Muscologia Britannica' of Drs. Hooker and Taylor, and 'British Flora,' vol. ii. part 1, by the former of these gentlemen. It is founded entirely on the structure of the capsule and its component parts, and the relative position of the seta and branches; as any characters derivable from the male flowers or gemmæ are entirely rejected. We are told, in the former of the works referred to above, that it "is founded on that of Lamarck and De Candolle, in their 'Flore Française' and 'Flora Gallica,' and such as has already been adopted in the Monograph of the British Jungermanniæ." This system has been defined by the talented author of the article "Musci" in the 'Encyclopædia Edinensis,' as one "more likely to last than any hitherto proposed." While it is undoubtedly in some respects very

artificial—frequently placing far apart genera united by many natural ties—it is the only one that is adapted for those who have but little opportunity of seeing the plants at all seasons, or who are not in circumstances to use the dissecting knife and microscope, so necessary for those who would make more natural systems the bases of their study. For these reasons we think it much the most useful to employ, in a popular work such as the present professes to be; and without further remark we refer the reader to a detailed Synopsis of the British Mosses immediately preceding the description of genera and species; giving such explanation of the terms as will, we trust, enable the tyro Muscologist, with the help of preceding chapters, and a good use of his eyes, natural and artificial, to assign their proper station and name to the mosses he may pick up.

Before closing our remarks on this branch of Muscology, we must briefly notice two other systems of more recent promulgation—that of Professor Lindley of London, in 'The Vegetable Kingdom,' and that adopted by Dr. C. Müller, a German muscologist, in his recently published 'Synopsis Muscorum Frondosorum.' These are both founded on the natural affinities and minute structure of Mosses, and therefore their excellencies can only be appreciated by the

advanced student. For scientific purposes they are undoubtedly much superior to the artificial arrangement adopted in the 'Muscologia Britannica.'

Professor Lindley includes all the true Mosses in the Natural Order "Bryaceæ" (Urn Mosses), making the "Andreaceæ," or "Split Mosses," a separate family of the "Muscal Alliance." These, with the other families of Cryptogamia, are part of the "Acrogens*."

Dr. Müller, in his 'Synopsis Muscorum,' makes his first class, "Schistocarpi," the same as Dr. Hooker's Division I., having the "inoperculate theca bursting with longitudinal valves." The second class, "Cleistocarpi," is so denominated from having an "inoperculate theca, opening by irregular bursts," as in *Phascum* and allied genera; and the third class, "Stegocarpi," contains of course the great majority of Mosses furnished with the true lid or operculum. This very large family is divided into the two very natural sections—also used by Dr. Hooker—of "Acrocarpous" and "Pleurocarpous" Mosses, or those whose fruit is terminal or lateral, with reference to the branches. When we come to minor divisions of "Tribes" and "Genera," we find a

* Flowerless plants in which the stems and leaves are distinguishable, in contrast with the "Thallogens," in which they are not so.

little closer inspection required, by those especially who have been conversant with Dr. Hooker's system. For instance, instead of the great separation between Gymnostomous (Mosses without a peristome), and Peristomous (furnished with one), we find in the same genus the two forms in separate sections—"Eperistomati" and "Peristomati."* Other sections are formed according as the plants have leaves disposed in two or more series, the areolation of these, and the presence or absence of "intercellular ducts," and the character of the fructification in a young state as monœcious or diœcious, *i. e.* have the "male and female" parts in the the same or in separate individuals.

We have thus briefly indicated the leading features of the classification adopted by Dr. Müller and other continental botanists, hoping that many of our readers will be led to proceed further in muscological research than this little work can guide them. Undoubtedly, with the progress made in this as well as other branches of botanical science during the last few years, any future Muscologia Britannica will be much modified in its arrangements by the discoveries made or making in the minute structures of the plants of which it treats.

* Those without, and those with, a peristome.

SYNOPSIS OF BRITISH MOSSES,

(According to the system adopted in Hooker's 'British Flora,' Vol. V. Part I.)

Section I. ACROCARPI.

This section comprises such Mosses as have their capsules or fructification situated at the summit of the branches. In some cases, from innovation—new side-branches growing out—these capsules appear to be of lateral growth.

Subsection I. ASTOMI.

Opening without a lid or operculum. A comparatively small number of Mosses belong to this subsection; they are known as the *Andreaceæ* and *Phascaceæ*, according as their capsules at maturity burst regularly or irregularly.

Genera :— I. Andreæa.
II. Phascum.

Subsection II. GYMNOSTOMI.

Mosses destitute of a true peristome or fringe at the mouth of the capsule. In some genera a membranous cover proceeding from the inner margin of the capsule or from an expansion of the *columella* protects the mouth of the capsule.

Genera :— III. Sphagnum.
IV. Œdipodium.
V. Gymnostomum.

VI. Anictangium.
VII. Schistostega.
VIII. Bartramidula.

Subsection III. PERISTOMI.

Such as are furnished with a true peristome. In some cases it is very fugacious and thus apt to mislead beginners.

Division 1. *APLOPERISTOMI.*

This division contains such genera as have a single peristome, or only one circle of fringes.

Genera :— IX. Diphyscium.
X. Tetraphis.
XI. Splachnum.
XII. Cyrtodon.
XIII. Conostomum.
XIV. Encalypta.
XV. Weissia.
XVI. Grimmia.
XVII. Didymodon.
XVIII. Trichostomum.
XIX. Glyphomitrion.
XX. Dicranum.
XXI. Tortula.
XXII. Cinclidotus.
XXIII. Polytrichum.

Division 2. *DIPLOPERISTOMI.*

Mosses with a double peristome, in some instances furnished also with additional ciliary processes.

Genera :— XXIV. Entosthodon.
XXV. Funaria.
XXVI. Zygodon.
XXVII. Orthotrichum.
XXVIII. Bryum.
XXIX. Timmia.
XXX. Bartramia.
XXXI. Buxbaumia.

Section II. PLEUROCARPI.

The genera in this division have their fruitstalks always rising laterally from the branch. It is a very natural division.

Subsection I. GYMNOSTOMI.

Genus :— XXXII. Hedwigia.

Subsection II. PERISTOMI.

Division 1. *APLOPERISTOMI.*

Genera :— XXXIII. Pterigonium.
XXXIV. Leucodon.

Division 2. *DIPLOPERISTOMI.*

Genera :— XXXV. Neckera.
XXXVI. Anomodon.
XXXVII. Daltonia.
XXXVIII. Fontinalis.
XXXIX. Hookeria.
XL. Hypnum.

Section I. ACROCARPI.

Subsection I. ASTOMI.

ANDREÆA, *Ehrh.* (Split Moss.)

(Forming the Class *Schistocarpi* and Tribe *Andreaceæ* of others.)

This is in various respects a peculiar genus. It holds as it were an intermediate position between the true Mosses and the genus *Jungermannia*, of the large family of *Hepaticæ* or *Liverworts*, among the latter of which it was placed by Linnæus; and Dr. Lindley, in his 'Vegetable Kingdom,' gives it rank as a separate natural family—*Andreaceæ*. Ehrhart, who instituted the genus, classed it with *Algæ*.

All the European species are found in Britain, and several new species have been lately discovered and described by Dr. J. D. Hooker, in the Auckland and adjacent islands. When they occur in quantities on our mountains, they give a shade of red-brownish colour to the rocks on which they grow; and when examined by a lens of considerable power, the leaves are beautiful objects of a rich transparent orange-brown tint.

Generic Character.—Capsule four-valved; the valves cohering

at the extremity by means of a persistent lid. Calyptra irregularly torn. Receptacle resembling a fruitstalk—in this respect like the *Hepaticæ*.

1. ANDRÆÆA ALPINA, Hedw. (*Alpine Split Moss.*) Stems branched; leaves obovate, suddenly acuminated, nerveless, straight, imbricating the stem on all sides.—*Eng. Fl. p.* 1; *Müll. Syn. pt.* 1. *p.* 7.

On rocks, in alpine and subalpine districts of the three kingdoms, but not very common. It has been found on Ben Nevis in great perfection. Fr. Spring.

2. ANDREÆA RUPESTRIS, Hedw. (*Rock Split Moss.*) Stems branched; leaves ovate, gradually acuminated, nerveless, the upper ones falcate. —*Eng. Fl. v.* 5. *pt.* 1. *p.* 1; *Müll. Syn. pt.* 1. *p.* 6.

Very generally distributed on rocks throughout the subalpine districts of Britain. Fr. Spring. Apt to be mistaken for the next species, *A. Rothii*, but readily detected by its *nerveless leaf* and *browner* colour. It is smaller than *A. alpina*, and is found in perfection much lower down. Its abundance gives quite a character to our mountain scenery, and though of sombre hue, the beauty of its structure well repays examination.

3. ANDREÆA ROTHII, Mohr. (*Black Falcate Split Moss.*)

Stems almost simple; leaves lanceolato-subulate, falcato-secund, fragile, nerved; those of the perichætium convolute, the innermost nerveless.—*Eng. Fl. p.* 1; *Müll. Syn. pt.* 1. *p.* 9.

Alpine rocks, with the other species. Fr. Spring. The presence of a nerve and hooked leaves distinguishes this species from the others. Müller enumerates two varieties of it found in Switzerland.

4. ANDREÆA NIVALIS, Hook. (*Tall Slender Split Moss.*) Stems slightly branched; leaves loosely imbricated, lanceolate, subfalcate, secund, nerved; those of the perichætium similar to the rest.—*Eng. Fl. pt.* 1. *p.* 2; *Müll. Syn. pt.* 1. *p.* 9.

Discovered by Hooker and Borrer on the summit of Ben Nevis, and also on other parts of the Cairngorum range. It is not unlikely that some of my readers may be treading these alpine heights, and should they meet with this species, they will find little difficulty in distinguishing it by its long pale-brown branches.

PHASCUM, *Linn.* (EARTH MOSS.)

A name of Greek origin, applied at first to a tree Lichen —*Usnea barbata*—but adopted by Hedwig for all the class

of minute Earth Mosses. Most of the British species have sessile fruit, and are very minute. Some retain the confervoid branches of the young fruit even after reaching maturity. By recent authors this genus has been a good deal divided, according to the structure of the fruit.

Generic Character.—Seta terminal. Capsule entire; lid persistent (of a piece with capsule). Calyptra dimidiate, in some cases approaching to mitriform.

* *Furnished with branched conferva-like shoots.*

1. PHASCUM SERRATUM, Schreb. (*Serrated Earth Moss.*) Shoots branched, conferva-like; perichætial leaves lanceolate, deeply serrated, nerveless.—*Eng. Fl. p.* 2. Ephemerum s., *Müll. Syn. pt.* 1. *p.* 31.

In a great variety of situations where the ground is somewhat shaded, and where there is some degree of moisture. Fr. Spring. So minute that it requires great care to detect it among the other mosses growing beside it. From its congeners it may be distinguished by the deep velvety-green colour of the plants, and fine reddish purple of the capsules. Two varieties of this species are enumerated:—

Var. *stoloniferum:* base of shoots opaque, not jointed.

Var. *angustifolium:* leaves narrower, subsecund, and more slightly serrate; capsule oval and smaller.

** *Conferva-like shoots none ; leaves more or less subulate; capsule nearly sessile.*

2. PHASCUM ALTERNIFOLIUM, Dicks. (*Alternate-leaved Earth Moss.*) Stems elongated; leaves entire, lanceolato-subulate, remote; innovations from immediately beneath the fruit.—*Eng. Fl. p.* 2. Archidium phascoides, *Brid. Bryol. Europ. and Müll. Syn. pt.* 1. *p.* 13.

Moist banks, not common in fruit. Fr. Jan. and Feb., and more or less throughout the season. This moss is remarkable for its lengthened shoots, resembling some Dicranums, and for its distant and alternately-placed leaves. The perichætial leaves are larger and longer than those of the stem, and sometimes contain more than one capsule. The seeds are large, greenish, and angular.

3. PHASCUM CRISPUM, Hedw. (*Curly-leaved Earth Moss.*) Leaves lanceolato-subulate, flexuose, crisped when dry.—*Eng. Fl. p.* 2. Astomum c., *Müll. Syn. pt.* 1. *p.* 24.

On banks and in fields. Fr. spring. The curled leaves are distinguishing marks of this species.

Var. *rostellata:* the elongated beaks of the capsule are chief mark of the distinction, and are deemed insufficient by Hooker to make it rank as a species, though Bruch and Schimper and Müller record it as such.

4. PHASCUM SUBULATUM, Linn. (*Awl-leaved Earth Moss.*) Leaves subulato-setaceous, straight, their nerve disappearing below the summit.—*Eng. Fl. p.* 3. Astomum s., *pt.* 1. *p.* 14.

Dry banks, fields, and heaths, frequent. Fr. Spring. Though the individual plants are minute, it is more easily detected than some other species, from being more gregarious.

5. PHASCUM AXILLARE, Dicks. (*Lateral-fruited Earth Moss.*) Leaves lanceolato-subulate, straight, their nerve disappearing below the summit; fruit often apparently axillary.—*Eng. Fl. p.* 3. Astomum nitidum, *Müll. Syn. pt.* 1. *p.* 17.

In similar situations as the preceding, but affecting a greater degree of moisture. The apparently axillary fruit is the chief mark of distinction. The leaves are also less setaceous and rigid.

**** Conferva-shoots none; leaves lanceolate or ovate; capsules nearly sessile.*

6. PHASCUM CRASSINERVIUM, Schwægr. (*Broad-nerved Earth Moss.*) Stemless; leaves erecto-patent, linear-lanceolate, dentato-serrate; nerve very broad and excurrent.—*Eng. Fl. p.* 3; *Müll. Syn. pt.* 1. *p.* 3.

Found by the Rev. M. J. Berkeley on limestone soil in

Northamptonshire. It has also been found in North America. Fr. Nov. and Dec. Müller mentions that the conferva-shoots are sometimes present. It has much the aspect of *P. serratum*.

7. PHASCUM PATENS, Hedw. (*Spreading Earth Moss.*) Stem short; leaves patent, narrow-ovate, serrated, nerve disappearing below the point.—*Eng. Fl. p.* 3. Ephemerum p., *Müll. Syn. pt.* 1. *p.* 33.

Clay banks and damp spots near rivers. Fr. Autumn and early Spring. While it has a resemblance to *P. cuspidatum*, it is easily distinguished from that species by its serrated leaves and the nerve disappearing before the point of the leaf. There is a variety with narrower leaves, which has been by some made a separate species—*P. recurvifolium*.

8. PHASCUM MUTICUM, Schreb. (*Common Dwarf Earth Moss.*) Stemless; leaves broadly ovate, concave, acuminate, more or less serrated, connivent; nerve reaching to the point.—*Eng. Fl. p.* 3. Acaulon m., *Müll. Syn. pt.* 1. *p.* 22.

Moist banks and elsewhere, on clayey soil. Fr. Autumn and early Spring. A very minute plant. The leaves, when the fruit is mature, wrap it so closely round that it resem-

bles a little shining bulb. There is a very minute variety of it found in Devonshire.

9. PHASCUM COHÆRENS, Hedw. (*Cohering Earth Moss.*) Leaves oblong-lanceolate, serrulate, furnished with a rib reaching to the point; capsule globose, shortly apiculate, brownish-purple.—Ephemerum cohærens, *Hampe, Müll. Syn. pt.* 1. *p.* 25.

Resembling *P. serratum*, but distinguished by its nerved and more oval leaves. Fr. autumn. Found in the west of England, by Messrs. Wilson and Mitten.

10. PHASCUM TRIQUETRUM. (*Triquetrous Earth Moss.*) Spruce, in London Journal of Botany, vol. iv. p. 189.—Acaulon t., *Müll. Syn. pt.* 1. *p.* 23.

Both Müller and the authors of Bryol. Europ. regard this as a distinct species from *P. muticum*, to which it is closely allied. The latter say, "This pretty species has long been confounded with *P. muticum*, from which it may easily be distinguished. The plants are shorter, more thickened, exactly triquetrous, when the fruit is mature of a pale brown colour; the capsule is larger and furnished with a longer pedicel, which is curved." Found at Brighton and other localities in the south by Messrs. Spruce and Wilson.

11. PHASCUM CUSPIDATUM, Schreb. (*Cuspidate Earth*

Buxbaumia aphylla.

Dicranum scoparium.

D. bryoides.

D. squarrosum.

Moss.) Stems sometimes elongated; leaves ovato-acuminate, erect, entire, nerve reaching to or beyond the point.—*Eng. Fl. p.* 4; *Müll. Syn. pt.* 1. *p.* 25.

Fields, gardens, and banks. Fr. Spring. It is scarcely possible to miss this little moss in any exposed locality during our walks in spring, and the glossy capsule shining amid its broad foliage is really a pretty object. It is found throughout all the cold and temperate regions of the earth, and varies much according to the locality in which it is found.

**** *Conferva-like shoots none; leaves more or less ovate; seta elongated.*

12. PHASCUM BRYOIDES, Dicks. (*Tall Earth Moss.*) Stem elongated; leaves ovate, apiculate; capsule elliptical.—*Eng. Fl. p.* 4; *Müll. Syn. pt.* 1. *p.* 28.

Banks and uncultivated fields in the south of England. Fr. Spring. The elongated stem distinguishes this from preceding species, but young beginners who may happen to find it may experience some difficulty in separating it from the *Gymnostomums,* in whose company it is often found. The absence of the lid is of course the distinguishing character. Its length of stem varies in different localities.

13. PHASCUM RECTUM, With. (*Straight-stalked Earth*

Moss.) Stem short; leaves ovate, with a short point; capsule globose, nearly erect.—*Eng. Fl. p.* 4; *Müll. Syn. pt.* 1. *p.* 27.

Calcareous and clayey fields, wall-tops, etc., chiefly in England and Ireland. Fr. Spring. Found associated with minute Weissias and Gymnostomums. It is common in France, but less so in Germany and the North.

14. PHASCUM CURVICOLLUM, Hedw. (*Crooked-stalked Earth Moss.*) Stem short; leaves narrow, ovate, acuminated; capsule globose; seta curved.—*Eng. Fl. v.* 5. *pt.* 1. *p.* 4; *Müll. Syn. pt.* 1. *p.* 27.

Moist banks in England. Fr. Spring. From *P. cuspidatum* this may be known by its lengthened fruitstalk, and from *P. rectum* by the curvature of that stalk, and by the more flexible, longer, and more acuminated leaves.

SUBSECTION II. GYMNOSTOMI.

SPHAGNUM, *Linn.* (BOG MOSS.)

This name originated with Pliny, the Roman naturalist, who applied it to certain arborescent Lichens and Mosses. Dillenius first applied it to this very natural family. All

grow in water or marshy ground, and are easily known by their pale colour, in some cases almost white. A foreign Moss, *Octoblepharum*, and *Dicranum glaucum*, found also in boggy grounds, are of the same pearly-white hue, and may be apt to mislead beginners. The leaves are nerveless, and are beautifully striated both longitudinally and transversely. The cells of which they are composed have often spiral fibres enclosed in them, which render them beautiful objects for microscopic observation. We have already spoken of the importance of this genus in the economy of nature, affording much of the material of which peat-fuel is composed. In Lapland and other Northern regions, as we learn from Linnæus and other botanical travellers, its use in domestic economy is not small. Our young readers have all gazed with admiration and delight on the wondrous skill and labour bestowed by the feathered tribes in preparing a secure and comfortable nest of moss and lichen for their tender progeny, but comparatively few, we believe, are aware that many of their little brothers and sisters in the cold countries of the North are cradled and protected in their babyhood by similar materials. To such, we trust, this portion of the history of the common Bog Moss, from Linnæus's 'Flora of Lapland,' will prove interesting:—

"The Lapland matrons are well acquainted with this Moss. They dry and lay it in their children's cradles, to supply the place of bed, bolster, and every covering; and being changed night and morning, it keeps the infant remarkably clean, dry, and warm. It is sufficiently soft of itself, but the tender mother, not satisfied with this, frequently covers the moss with the downy hairs of the reindeer, and by that means makes a most delicate nest for the new-born babe."

Generic Character.—Receptacle of fruit resembling and performing the office of a fruitstalk (see also character of *Andreæa*). Capsule sessile on the receptacle, its lid deciduous; mouth naked. Calyptra irregularly torn and very fugacious.

1. SPHAGNUM OBTUSIFOLIUM, Ehrh. (*Blunt-leaved Bog Moss.*) Branches tumid; leaves ovate, obtuse.—*Eng. Fl.* S. cymbifolium, *Müll. Syn. pt.* 1. *p.* 91.

Everywhere abundant in bogs and still pools, especially near heaths and in moorland districts.

Linnæus and early writers on Mosses included all our British or European *Sphagnums* under one species, *S. palustre,* subsequently to which some German authors subdivided it into as many as nine and fourteen. We are of opinion that Hooker and Taylor judiciously "steered a mid-

dle course" in restricting our British species to the four we now enumerate. The fact of C. Müller, in his late valuable 'Synopsis Muscorum,' circumscribing these within almost similar bounds, proves that the anticipations of the authors of the 'Muscologia Britannica,' that few of these ambiguous species would "prove constant to their characters," was correct.

It is no doubt an interesting study to note the different forms this varying Moss assumes; and those who wish to pursue the subject further will find three varieties described by Hooker and Müller in the pages of the works referred to above. When the foliage gets old, or is exposed to drought, it assumes a reddish hue.

2. SPHAGNUM SQUARROSUM, Web. and Mohr. (*Spreading-leaved Bog Moss.*) Branches attenuated at the extremities; leaves ovato-acuminate, squarrose, recurved.—*Eng. Fl. p.* 5.

Bogs; common. Fr. Summer. Distinguished from the former by its acuminate or pointed leaves, which are reflexed at the extremity, and give it a very distinct appearance.

3. SPHAGNUM ACUTIFOLIUM, Ehrh. (*Slender Bog Moss.*) Branches attenuated; leaves ovato-lanceolate, crowded.—*Eng. Fl. p.* 5; *Müll. Syn. pt.* 1. *p.* 96.

Bogs, and similar situations with the others. Fr. Spring and early summer. This was regarded by Linnæus and others as a variety of *S. obtusifolium*, but it retains its specific character fully as well as any.

4. SPHAGNUM CUSPIDATUM, Ehrh. (*Long-leaved Floating Bog Moss.*) Branches attenuated; leaves lanceolato-subulate, lax.—*Eng. Fl. p.* 6; *Müll. Syn. pt.* 1. *p.* 96.

Wet bogs and similar situations, where it can be wholly immersed in water; rare in fruit. Fr. Spring. This species varies much in the form and direction of the leaves, and has been by some regarded as an aquatic variety of *S. acutifolium*. It sometimes attains a great length, as Dr. Greville records a specimen four feet long, with leaves three-fourths of an inch in length.

ŒDIPODIUM, *Schwægr.* (CLUB-STALKED MOSS.)

The swollen appearance of the footstalk in its upper portion, from which the generic name is derived, is its chief distinction from *Gymnostomum*. In habit it very much resembles the genus *Splachnum*.

Generic Character.—Seta terminal, thick, fleshy. Mouth of

capsule without peristome, but provided with a horizontal membrane, which can only be well seen when the plant is fresh. Calyptra dimidiato-mitriform.

ŒDIPODIUM GRIFFITHIANUM, Schwægr. (*Griffithian Club-stalked Moss.*) Leaves large, roundish, obovate, strongly reticulated and succulent. Stem scarcely any. Seta thick and fleshy, upwards especially, where it swells into the oval, nearly erect capsule. Lid hemispherical.—*Eng. Fl. p.* 6.

First found on Ingleborough in Yorkshire, and subsequently discovered on Ben Lawers, Ben Nevis, Ben Cruachan, Clova, and other mountains of Scotland. It has also been found in Norway. Fr. August. This is an interesting Moss, and further details of its description and appearance are embodied in the Engl. Fl. and Muscologia Britannica.

GYMNOSTOMUM, *Hedw.* (BEARDLESS MOSS.)

The Greek words of which the name of this genus is composed, refer to the "naked mouth," which is the distinguishing character of this and the other genera in the subsection.

It is undoubtedly in many instances a very artificial genus,

and recent authorities on Muscology have almost done away with it, and dispersed the different species among others, to which they have affinities of different kinds. The genus *Pottia* and family of *Pottiaceæ* contains the most characteristic species, which are here associated *Weissia* and *Grimmia*. While feeling that this is the truly natural arrangement, we have thought it best not to deviate from the rule we have laid down, to adhere to that system most likely to facilitate the researches of the tyro muscologist.

Generic Character.—Seta terminal, slender, rigid. Mouth of the capsule naked, or at most, in an early stage, closed with a more or less complete horizontal membrane. Calyptra dimidiate. Leaves inserted on all sides of the stem.

* *Stems more or less elongated, branched.*

1. GYMNOSTOMUM CÆSPITITIUM, Web. and Mohr. (*Minute Tufted Beardless Moss.*) Leaves lanceolato-subulate, canaliculate, obscurely nerved, very straight even when dry, those of the perichætium much longer than the turbinate, quite furrowless capsule.—*Eng. Fl. p.* 6. Blindia Stylostegium, *Müll. pt.* 1. *p.* 345.

Discovered by Dr. Hooker on Ben Lawers, near the summit, in 1830. It is found on moist rocks on the Swiss and German Alps. Fr. July and August.

2. GYMNOSTOMUM LAPPONICUM, Hedw. (*Lapland Beardless Moss.*) Leaves linear-lanceolate, channelled on the upper side along the pellucid nerve, crisped when dry, those of the perichætium broadly ovate, convolute; capsule subexserted, turbinate, furrowed.—*Engl. Fl. p.* 7. Zygodon Lapponicus, *Müll. Syn. pt.* 1. *p.* 680.

Abundant on the summits of the higher mountains of Scotland; it has also been found on Snowdon, and is not rare on the range of the Alps. Fr. July. It only bears fruit at high altitudes, growing in the crevices of rocks. In mild and moist situations it is barren, and produces stems three to five inches long.

3. GYMNOSTOMUM VIRIDISSIMUM, Sm. (*Green Tufted Beardless Moss.*) Leaves broadly lanceolate, patent, dotted; capsule ovate, furrowed when old, lid obliquely rostrate.—*Engl. Fl. p.* 7. Zygodon viridissimus, *Müll. Syn. pt.* 1. *p.* 671.

On trees,—according to Müller and Schimper, chiefly on oaks and chestnuts,—and more abundant in the south of England than further north. In Scotland it has been found on rocks in several localities. The leaves are of a pale yellow-green and are beautifully dotted. In habit it resembles an *Orthotrichum*. The absence of a peristome is

almost the only distinguishing mark between this Moss and *Zygodon conoideus*, in whose company it is sometimes found, and with which genus recent writers associate it. It is found, but not abundantly, in France and Germany.

4. GYMNOSTOMUM CURVIROSTRUM, Hedw. (*Curved-beaked Beardless Moss.*) Leaves lanceolate-subulate, erect, rigid, straight when dry; capsule (brown) broadly ovate, lid obliquely rostrate, longer than the capsule.—*Engl. Fl. p.* 7. Weissia curvirostris, *Müll. Syn. pt.* 1. *p.* 658.

Moist rocks, especially such as are calcareous, in several situations in Britain and Ireland. Fr. Summer. It is a variable Moss, and has by its synonyms caused a good deal of discussion. Müller records three of these varieties.

5. GYMNOSTOMUM RUPESTRE, Schwægr. (*Tufted Rock Beardless Moss.*) Leaves linear-subulate, patent, flaccid, flexuose, twisted when dry; capsule (pale) ovate; lid conico-rostrate, shorter than the capsule.—*Engl. Fl. p.* 8. Weissia rupestris, *Müll. Syn. pt.* 1. *p.* 657.

Moist dripping rocks; more abundant in subalpine districts. Fr. Summer and Autumn. This also varies somewhat in its character, and three of these varieties are described by Müller. The leaves are of a softer consistence than *G. curvirostrum*, which it much resembles.

One can scarcely take an autumn botanical ramble in a rocky dell,—

> "Among the hollow rocks,
> Whence gush the streams, the ceaseless fountains play,
> And their unfailing wealth the rivers draw,"—

without encountering the pale green cushions of this beautiful Moss, bedecked here and there with its glossy brown capsules.

6. GYMNOSTOMUM TORTILE, Schwægr. (*Twisted Beardless Moss.*) Stems tufted; leaves ovate-lanceolate, obtuse, their margins involute, their nerve excurrent; capsule oval; lid nearly straight (oblique, according to Müller), somewhat shorter than the capsule.—*Fl. Hibernica, pt.* 2. *p.* 10. Weissia tortilis, *Müll. Syn. pt.* 1. *p.* 661.

On cliffs of mountain-rocks, especially of banks of rivers; very common in the south of Ireland. Fr. Spring. Such is the locality and description given by Dr. Taylor, who first recorded it as a native of our Isles. It is also found in mountain districts in the south of Europe, but "nowhere common." From *G. microstomum,* to which it is allied, it is distinguished by its more robust habit and broader leaves. Fragments of an *annulus* are sometimes found in the mouth of the capsule.

** *Stems short, scarcely branched.*

7. GYMNOSTOMUM OVATUM, Hedw. (*Hairy-leaved Beardless Moss.*) Leaves ovate, erect, concave, piliferous, nerve expanded into a gemmiferous membrane; lid rostrate.—*Engl. Fl. p.* 8. Pottia cavifolia, *Müll. Syn. pt.* 1. *p.* 550.

Banks, wall-tops, etc. Fr. December to February. Wherever a wall-top gets a coating of clay, or a heap of similar material has been allowed to accumulate at a hedge-side, this little interesting moss will likely be found in one state or another. The piliferous points of its leaves retain the rains and fogs of winter long after these have been shaken off by its neighbours, and by this appearance alone it may be sometimes detected. The expanded portion of the nerve, sometimes containing *gemmæ*, is an interesting object for the microscope. It varies with leaves slightly piliferous and an oblong capsule, the latter form being the var. *gracilis* of Hooker.

8. GYMNOSTOMUM TRUNCATULUM, Hoffm. (*Little Blunt-fruited Beardless Moss.*) Leaves oblongo-obovate, acute, apiculate, patent, reticulated, pellucid, entire, nearly plane, their margins recurved; capsule ovate or turbinate; lid obliquely rostrate.—*Engl. Fl. p.* 8. Pottia eustoma, *Müll. Syn. pt.* 1. *p.* 553.

On banks, fallow fields, garden-ground, etc. Fr. Autumn and Winter. Rather fonder of shade than the former species, as it is usually found where there is some protection from little grass-tufts or some of the larger Mosses. It varies a good deal in size, form of the capsules, and length of the stems, of which the two enumerated below seem the most distinct.

Var. *major:* more robust; capsule oval-oblong, truncate.

Var. *subcylindrica:* leaves more lanceolate, with long points; capsule subcylindrical. This is not so common in Britain. It seems to be the var. described by Dr. Taylor in Fl. Hibernica, as growing near Cork.

9. GYMNOSTOMUM WILSONI, Hook. (*Wilsonian Beardless Moss.*) Leaves oblong-obovate, obtuse, apiculate, minutely reticulated, opaque, entire, the margin slightly recurved; capsule oblong-elliptical, a little contracted at the mouth; lid obliquely rostrate, calyptra scabrous above.—*Engl. Fl. p.* 8. Pottia Wilsoni, *Müll. Syn. pt.* 1. *p.* 554.

Discovered near Over, in Cheshire, by Mr. Wilson, and also near Bangor, and Anglesea. Forfar, Mr. Drummond. Fr. February. Much resembling in appearance some varieties of *G. truncatum*, but, on the application of a magnifying power, shown to be very distinct. Dr. Hooker, in

the 'Botanical Miscellany' for 1830, p. 143, gives an interesting account of its structure and appearances.

Pottia (Gymnostomum) crinita, Wilson. Leaves spathulate, very obtuse, with a strong midrib extended by a green hair; calyptra smooth, shorter than the capsule; mouth of capsule wide; footstalk in the upper part twisted to the left and below to the right.—*Bry. Europ. Fasc.* 42. *Supp. Müll. Syn. pt.* 2. *p.* 622.

Discovered by Mr. Wilson in moist sandy soil near the shore at Aberdeen in 1843 and 1844, also by Mr. Ralfs on the Cornish coast. Fr. Spring. In habit and disposition of the leaves it resembles *G. Wilsoni*.

10. Gymnostomum Heimii, Hedw. (*Long-stalked Beardless Moss.*) Leaves lanceolate, serrated at the point; lid obliquely rostrate.—*Engl. Fl. p.* 9.

Moist pastures, especially near the sea. Fr. May. Like a large form of *G. truncatum* or *Wilsoni*. The leaves frequently have a reddish hue, with attenuated margins.

11. Gymnostomum conicum, Schwægr. (*Blunt-lidded Beardless Moss.*) Leaves oblong-ovate, apiculate, spreading, strongly recurved at the margin; capsule more or less ovate, lid conical.—*Eng. Fl. p.* 9. Pottia minutula, *var.* conica, *Müll. Syn. pt.* 1. *p.* 555.

Near Cork, Dublin, Cheshire, and other localities in the north of England, in fields and garden-walks. Fr. Feb. A very minute species, and requiring some skill to detect it amid the society of other minute Mosses. It is the *G. minutulum* of several Continental botanists.

12. GYMNOSTOMUM FASCICULARE, Hedw. (*Blunt Pear-shaped Beardless Moss.*) Leaves oblong-acuminate, nearly plane, subserrated, margined; capsule pyriform; lid plane or subconvex, submammillate.—*Eng. Fl. p.* 9. Entosthodon ericetorum, *Müll. Syn. pt.* 1. *p.* 122.

Wet banks and rocks. Fr. Spring. A gregarious Moss and a very neat species. The foliage, and especially the fruit, is frequently of a reddish hue.

The *Entosthodon* or *Physcomitrion* (Gymnostomum) *fasciculare* of recent authors is somewhat different in appearance, and that described by us is the rarer of the two; only one Irish station, in Connemara, being given as a habitat within our boundaries. The form of capsule and structure of leaf are the distinguishing marks. This, on the authority of Sir J. E. Smith, is regarded as the *Hyssopus Salamonis*, "Hyssop on the wall," of Hasselquist, the learned botanical traveller, whose specimens we believe are still preserved in the Linnean Herbarium.

13. GYMNOSTOMUM PYRIFORME, Hedw. (*Sharp Pear-shaped Beardless Moss.*) Leaves ovato-acuminate, concave, serrated, not margined; capsule roundish-obovate; lid convex, shortly rostrate.—*Engl. Fl. p.* 9. Physcomitrium pyriforme, *Müll. Syn. p.* 116.

Wet banks and ditch-sides, in shady situations. Fr. Spring. With much of the habit of the preceding species, from which it may be distinguished by the want of a thickened margin to the leaf and the lid being slightly rostrate. It is also paler in colour and larger in size. Frequently associated with *Funaria hygrometrica.*

14. GYMNOSTOMUM TENUE. (*Few-leaved Beardless Moss.*) Stems scarcely any; leaves linear-lanceolate, entire, erect, obtuse, short, with a strong nerve, disappearing below the summit; the upper or perichætial ones much elongated and with an obscure nerve; capsule oblong, lid acuminated. —*Engl. Fl. p.* 10. Weissia tenuis, *Müll. Syn. pt.* 1. *p.* 660.

On sandstone rocks, especially where there is a slight degree of moisture. Fr. June. An interesting little species, and, being furnished with an *annulus,* or thickened ring, at the mouth of the capsule, may be regarded as a connecting link with the Fringed-mouth Mosses. Though no-

Daltonia heteromala.

Cinclidotus fontinaloides.

Fitch, del et lith.

P. Reeve, imp.

where very abundant, it is found generally over the country and is plentiful on the Continent.

15. GYMNOSTOMUM DONIANUM, Sm. (*Donian Beardless Moss.*) Stem scarcely any; leaves subulate; capsule turbinate; lid hemispherical, with an acuminated point.—*Engl. Fl. p.* 10. Seligeria Doniana, *Müll. Syn. pt.* 1. *p.* 420.

Sandstone rocks. Discovered by the late Mr. Don in the Den of Dupplin, in Perthshire, and subsequently in similar situations in Scotland and the north of England. It has also been found since in Norway and various districts of Germany. Much resembling *Weissia* (Seligeria) *pusilla*, which grows in similar localities. By Bruch and Schimper it is made a separate genus—*Anodus*.

16. GYMNOSTOMUM MICROSTOMUM, Hedw. (*Small-mouthed Beardless Moss.*) Leaves broadly subulate, their margins involute above the middle, flexuose, crisped when dry; capsule elliptical, contracted at the mouth; lid subulate, incurved.—*Engl. Fl. p.* 10. Weissia microstoma, *Müll. Syn. pt.* 1. *p.* 661.

Banks, chiefly in subalpine districts. All writers on Mosses refer to the great similarity existing between this species and the common *Weissia contraversa*, bearing the same relation to it that *G. viridissimum* does to the genus

Zygodon, *i. e.* the absence of the peristome. Mr. Wilson, a deservedly trustworthy authority, has indeed found specimens of this plant in a locality in Wales, in which there are distinct traces of a peristome: his interesting account will be found in the description of the species. Müller enumerates four varieties of this species.—*Engl. Fl. p.* 11. *Müll. Syn. pt.* 1. *p.* 660.

17. HYMENOSTOMUM (Gymnostomum) PHASCOIDES, Wilson.—Weissia phascoides, *Synop. Musc. Fr.* ii. 634.

Lower cauline leaves lanceolate and linear-lanceolate, upper ones crowded into a squarrose tuft, linear-lanceolate, very long and flexuose, with the midrib running out into a point, both surfaces from the middle to the point minutely papillose; several setæ from the same branch; capsule erect or oblique, as short again as the perichætial leaves, subspherical, ovate or elliptical; lid convexo-conical, shortly rostellate, subpersistent.

Found in damp sandy and clayey soil, near Mere in Cheshire, by Mr. Wilson, and also by Mr. Mitten in 1847, at the margin of a drained fishpond near Hurstpierpoint in Sussex. Nearly allied to the *H. squarrosum*, a rare Continental species.

ANŒCTANGIUM, *Hedw.* (BRANCHED BEARDLESS Moss.)

So named from two Greek words signifying "an open vessel,"—the capsule, imbedded in the leaves, having a beautifully cup-shaped appearance. It is separated from *Gymnostomum* by having a mitriform instead of dimidiate capsule.

Generic Character.—Fruitstalk terminal; mouth of the capsule naked; calyptra mitriform.

1. ANŒCTANGIUM CILIATUM, Hedw. (*Hoary-branched Beardless Moss.*) Leaves subsecund, ovate, concave, distinctly dotted, not striated, the margins below recurved, above plane, acuminated, and more or less diaphanous at the point, those of the perichætium toothed or serrated at the extremity; capsule sessile, turbinate; lid plane, subumbonate.—*Engl. Fl. p.* 11. Pilotrichum ciliatum, *Müll. Syn. pt.* 2. *p.* 164.

Rocks and stones, especially in hilly districts. Fr. March. Few can have trod the hills and vales of our native land with any observing, not to say scientific, eye, without noticing the conspicuous hoary tufts of this elegant Moss, easily distinguished from others of somewhat similar habit,

and appearance. In exposed situations the stems are short and the projecting hair of the leaf rigid and elongated, while in shady places the former are much extended, and the latter much shortened, resembling some other Mosses natives of woods.

Var. *imberbe: A. ciliatum*, var. *rufescens* of Arnott. Stem-leaves coloured at the points, those of the perichætium diaphanous and serrated. Mountains in the south of Ireland.

Var. *striatum:* leaves longitudinally striated or plicate. Rocks in Caernarvonshire, and at Glengariff, Ireland. Both the above varieties have been constituted species in various works on Bryology, but from their varying character and slight differences in external aspect we rank them only as varieties of *A. ciliatum*. *A. imberbe* is ranked as a *Neckera* in Müller's Synopsis.

SCHISTOSTEGA, *Mohr.* (Schistostega.)

Name signifying "cleft lid," from the idea of Mohr, that traces of the divisions could be observed in the mature operculum. The genus consists of only one species.

Generic Character.—Seta terminal. Capsule without peristome. Calyptra campanulate, fugacious. Lid thick.

1. SCHISTOSTEGA PENNATA. (*Feather Schistostega.*) Stem generally simple, at times with innovations; leaves rhomboideo-oval, acuminate, bifarious, decurrent on the stem and quite entire.—*Engl. Fl. p.* 12. S. osmundacea, *Müll. Syn. pt.* 1. *p.* 38.

Moist and shady banks; in caves and similar localities impervious to the solar rays, on sandy or allied rocks. Fr. Spring and early Summer. We could fill a large space with a description of the general appearance and structure of this interesting and peculiar little Moss, but must forbear, and refer our readers who wish to know these more intimately to Dr. Hooker's valuable works, the 'English Flora,' and 'Muscologia Britannica.' In appearance the leaves are much like the *Fissidens* section of the genus *Dicranum,* or perhaps we should say like some elegant species of Fern in miniature. The foliage and stems are graceful, with a slightly reddish tinge, the latter beautifully reticulated. It is often, in the shady retreat where it loves to grow, accompanied by what appear to be the young plants,—protothallus or confervoid branches. It has been observed that the minute cells of these branches reflect

the light which reaches the caves in which they grow. Found first in the south of England, but subsequently in various districts of the north, and especially so in Lancashire, whence our valued correspondent Mr. Nowell has sent numerous and beautiful specimens.

BARTRAMIDULA, *Br. et Sch.* (BARTRAMIDULA.)

A diminutive of *Bartramia*, from which it is chiefly distinguished by the want of a peristome.

Generic Character.—Seta terminal. Capsule subglobose, without peristome. Calyptra dimidiate, very fugacious.

1. BARTRAMIDULA WILSONI. (*Mr. Wilson's Bartramidula.*) Stem short, prostrate, and furnished with fibres; cauline leaves short, lanceolate, the upper ones secund or subfalcate, perichætial ones longer and thinner; the nerve disappearing below the point; capsules (1–5 together) curved in a horizontal direction, smooth, and finally shrivelled; lid minute, convex.—Glyphocarpa cernua, *Wilson in London Journal of Bot.* 1841, *pt.* 8. Bartramia Wilsoni, *Müll. Syn. pt.* 1. *p.* 479.

On Cannon Hill in Ireland, and on the Clova mountains

at the head of Glen Dale in Scotland. Fr. Summer. Here is a little "gem," brought to the light of human knowledge, as far as we have any record, within the last dozen years. We are wont to speak of these commodities as being borne alone by the "deep unfathomed caves of ocean," but the history of this little Moss may show us how very circumscribed our knowledge of objects within easy reach may be. It very much resembles the *Bartramia fontana* in miniature, so much so as to lead Mr. Wilson, the discoverer, to think that it might be only a variety. Another species, the *B. Roylei*, from the Himalaya and Neilgherries in India, closely resembles this, but has erect capsules. From these mountains we have also many flowering plants partaking much of European types and habits.

SUBSECTION III. PERISTOMI.

Division 1. *APLOPERISTOMI.*

DIPHYSCIUM, *Mohr.* (DIPHYSCIUM.)

Literally, two bladders or vessels, from the double membrane of which the capsule is composed. It was united by Schwægrichen with *Buxbaumia*, and in the form of the cap-

sule much resembles that curious Moss, but the peristome is very distinct.

Generic Character.—Seta terminal. Capsule gibbous. Peristome single, forming a plicate, membranous, truncate cone.

1. DIPHYSCIUM FOLIOSUM. (*Leafy Diphyscium.*) Stem short; cauline leaves ligulate, somewhat concave; perichætial much larger and broadly lanceolate, with a nerve running out into a stout hair, laciniate at the top; calyptra smooth, mitriform.—*Engl. Fl. p.* 13; *Müll. Syn. pt.* 1. *p.* 812.

Banks, wall-tops, etc., in alpine situations, often with its growth downwards. Fr. Summer. The curious plicate membrane forming the peristome of this Moss is sufficient to distinguish it from others; when in fruit it is easily distinguished. It turns to a dingy brown in drying.

TETRAPHIS, *Hedw.* (TETRAPHIS.)

The four erect teeth at the mouth of the capsule, which give the name to the genus, are easily distinguishable. *Tetrodontium,* the name given by Schwægrichen, seems more expressive. Müller, in his Synopsis, has returned to the original name, *Georgia,* of Ehrhart, who, from "a deep feeling of gratitude" to our good King George III., "an

eminent patron of botanical study," instituted this genus in his honour.

Generic Character.—Seta terminal. Peristome single, of four erect, cellular teeth. Calyptra mitriform, plicate.

1. TETRAPHIS PELLUCIDA, Hedw. (*Pellucid Tetraphis.*) Stems elongated; leaves ovate, acuminated, those of the perichætium lanceolate; capsule cylindrical.—*Eng. Fl. p.* 14. Georgia Mnemosynum, *Müll. Syn. pt.* 1. *p.* 182.

Decaying trunks of trees, and on the ground chiefly in hilly districts. Fr. Spring and Summer. The specific name, "pellucid," is well applied to this elegant little Moss, as no character is more marked than the delicate transparency of its pale, somewhat rigid, and neatly arranged foliage. The fruit is not very plentful, but we always find on the summit of some of the branches little cup-shaped receptacles formed of broadly obcordate leaves, within which are placed little spherical bodies attached by a footstalk, and presenting much analogy with the "anthers" of a *Jungermannia.* The segments of the peristome are also of a peculiarly rigid structure, and have their origin a good deal within that of the external edge of the capsule, which gives them the appearance of a separate tube.

2. TETRAPHIS BROWNIANA, Grev. (*Mr. Brown's Tetra-*

phis.) Stems very short; leaves few, linear, slightly incrassated upwards, those of the perichætium ovate, obtuse; capsule ovate.—*Eng. Fl. p.* 14. Georgia ovata, *Müll. Syn. pt.* 1. *p.* 181.

Rocks, generally of sandstone, growing chiefly on such as have their surfaces looking downwards. Fr. Summer. Whole plant of a brownish colour and rigid habit. The two forms of leaves mark it very distinctly, those that belong to the barren stem being peculiarly linear, and somewhat thickened upwards at times, with one or two clefts. When growing on granite these are said to be absent, and this is recognized by some botanists as the only distinction between it and *T. ovata,* found on the Continent.

SPLACHNUM, *Linn.* (SPLACHNUM.)

This name was originally applied by Dioscorides to a genus of Lichens, probably *Sticta,* and subsequently adopted by Linnæus for this family. A natural group of Mosses, interesting chiefly from their elegant capsules, furnished with their peculiar *apophyses,* or *strumæ,* and the remarkable habits most of the species affect, to which we have referred in speaking of their places of growth. There are two

species, which, as we cannot enumerate as British, we think, from the interest attaching to them and being denizens of our northern regions, must not be passed over without some slight notice: these are *S. rubrum* and *luteum*, natives of the bogs of Norway, Lapland, Siberia, and corresponding latitudes on the North American continent. Their length, chiefly occupied by the seta, is three or four inches, with leaves of corresponding dimensions; but the most conspicuous object is the large red or yellow apophysis, spreading immediately under the capsule, in the form of a dome or umbrella, to which it has been compared by Dillenius, who describes it as distinguished "*umbraculo ruberrimo.*" We have heard that the inhabitants of those countries use bright red umbrellas: may they not have copied this fashion from the "Bon-grace Moss," the English name given to *Splachnum rubrum?* The former is the more common species. For further particulars regarding these and the other species, our readers may consult an article on the genus *Splachnum* in the 'Amœnitates Academicæ' of Linnæus.

1. SPLACHNUM SPHÆRICUM, Linn. fil. (*Globe-fruited Splachnum.*) Leaves obovato-rotundate, acuminate, slightly serrated; apophysis ovate-globose, wider than the capsule. —*Eng. Fl. p.* 14; *Müll. Syn. pt.* 1. *p.* 144.

On the dung of animals in subalpine districts. Fr. Summer. This species is found more abundantly than the others. It varies considerably in the length of its stem, and the seta is sometimes flexuose.

2. SPLACHNUM TENUE, Dick. (*Slender Splachnum.*) Leaves obovate, acuminate, serrated; apophysis obconical, narrower than the capsule; columella exserted.—*Eng. Fl. p.* 15. Tayloria serrata, *var.* tenuis, *Müll. Syn. pt.* 1. *p.* 133.

On turfy soils of the more elevated Scotch mountains. Abundant on Ben Lawers. Fr. Autumn.

3. SPLACHNUM MNIOIDES, Linn. fil. (*Brown Tapering Splachnum.*) Leaves obvato-lanceolate; much acuminated, concave, entire; apophysis obovate, nearly as narrow as the capsule.—*Eng. Fl. p.* 15. Tetraplodon mnioides, *Müll. Syn. pt.* 1. *p.* 130.

On the ground in mountainous districts, sometimes associated with other Mosses. Fr. Summer. Two varieties are enumerated by Sir W. J. Hooker, viz. *minus* and *majus*, the former distinguished by its darker colour and shorter stems, and the latter by these being paler and more elongated. The new genus *Tetraplodon* is in the Natural System intermediate between *Tayloria* and *Splachnum*.

4. SPLACHNUM ANGUSTATUM, Linn. fil. (*Narrow-leaved*

Splachnum.) Leaves obovato-lanceolate, much acuminated, serrated; apophysis obovate, somewhat narrower than the capsule; fruitstalks shorter than the leaves.—*Eng. Fl. p.* 15. Tetraplodon angustatum, *Müll. Syn. pt.* 1. *p.* 130.

On the mountains, but rare, growing on cow-dung and other decaying animal substances. Fr. Autumn. Somewhat peculiar in its appearance, from the leaves being longer, and the seta generally shorter, than those of other species.

5. SPLACHNUM AMPULLACEUM, Linn. (*Flagon-fruited Splachnum.*) Leaves ovato-lanceolate, acuminate, serrated; apophysis inversely flagon-shaped, twice as wide as the capsule.—*Eng. Fl. p.* 15; *Müll. Syn. pt.* 1. *p.* 140.

Bogs, on the ground and on the dung of animals, frequent in the plains. Fr. Summer. A very elegant species, the large apophysis resembling a beautifully moulded flagon or vase. It is the only one our friends in the Lowlands are likely to meet with.

6. SPLACHNUM VASCULOSUM, Hedw. (*Large-fruited Splachnum.*) Leaves rhombeo-rotundate, the nerve disappearing below the point; apophysis much wider than the capsule.—*Eng. Fl. p.* 16; *Müll. Syn. pt.* 1. *p.* 145.

At the sources of springs on the mountains of Scotland, at an elevation of not less than 3000 feet. Ben More and

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Clova are the two principal localities that have been mentioned. It is found but sparingly throughout the Breadalbane range. The leaves are large and bright green, and the capsules are large, dark-coloured, and polished, making it a very conspicuous object. Gardiner, in his 'Lessons,' has remarked that "the habitation of a plant like this, is associated with much that is grand and interesting." Majestic mountains, extensive forests, and foaming streams make up a grand and awe-inspiring scene, while we

> "Sit by mossy fountain
> Where a sweet stream has its birth,
> And look around with admiring eye
> On the lovely things of earth,—
> The Lichen, the Moss, and the mountain flower,
> And the wild bee revelling there."

7. SPLACHNUM FRŒLICHIANUM, Hedw. (*Frœlichian Splachnum.*) Leaves elliptical, very obtuse, their nerve disappearing between the summit; apophysis obovate, much narrower than the capsule; teeth of the peristome sixteen, geminate, erect when dry.—*Eng. Fl. p.* 16. Dissodon F., *Müll. Syn. pt.* 1. *p.* 138.

Ben High, Aberdeenshire, Mr. Dickson. Fr. Summer and Autumn. Remarkable for its obtuse leaves, which with its habit ally it with the succeeding genus. It is very rare

in Britain, but occurs in considerable quantity on the Swiss and Norwegian Alps and on the Rocky Mountains of North America.

CYRTODON, *Br.* (CYRTODON.)

Named so by Brown, from the convexity of the teeth of the peristome. It has had a place in five other genera, by as many different authors, which shows how difficult it is to fix on such characters as will separate it from its congeners.

Generic Character.—Seta terminal. Peristome single, of sixteen equidistant, entire teeth, marked with a central line, incurved when dry. Capsule with an apophysis. Calyptra mitriform, becoming dimidiate, smooth, without furrows.

1. CYRTODON SPLACHNOIDES, Br. (*Splachnoid Cyrtodon.*) Leaves erecto-patent, lingulated; seta elongate; capsule obovate; apophysis obconical.—*Eng. Fl. p.* 17. Dissodon splachnoides, *Müll. Syn. pt.* 1. *p.* 139.

Turf-bogs on the loftier mountains of Scotland. Fr. Summer and Autumn. Growing in dense tufts, which may be distinguished from others by their dark lurid colour.

"Emerald moss,
Whose fairy goblets the turf emboss."

CONOSTOMUM, Swartz. (Conostomum.)

"Conical mouth," so named on account of the teeth of the peristome forming a cone by their union at the summit.

Generic Character.—Seta terminal. Peristome single, of sixteen equidistant teeth, all united at their summits. Calyptra dimidiate.

1. Conostomum boreale, Sw. (*Northern Conostomum.*) Stems elongated; leaves lanceolate, acuminate, carinate, glaucous, slightly toothed.—*Engl. Fl. p.* 17; *Müll. Syn. pt.* 1. *p.* 469.

On the summits of the mountains, not descending lower than 3000 feet. Fr. July and September. In external appearance much resembling the Fountain Apple-Moss, and has been by several authors arranged with *Bartramia.* It loves the damp oozy spots left by the snow for a short time in summer. Barren stems are sometimes found four or five inches long, though when fertile it does not exceed one and a half inch.

"Vainly in its icy manacles
May winter seek thy plenitude to bind."

Didymodon purpureum.

Encalypta vulgaris.

Diphyscium foliosum.

Fitch, del. et lith. P. Reeve, imp.

ENCALYPTA, Hedw. (Extinguisher Moss.)

A very appropriate name, for it requires no stretch of the imagination to see the resemblance of the elegant calyptra to the useful implement indicated by its English title.

Generic Character.—Seta terminal. Peristome single, of sixteen teeth. Calyptra campanulate, smooth, entirely closing the mature capsule.

1. Encalypta streptocarpa, Hedw. (*Spiral-fruited Extinguisher Moss.*) Stems elongated; leaves elliptico-lanceolate, somewhat obtuse, their nerve not produced beyond the summit; capsule cylindrical, spirally striated; calyptra toothed at the bases.—*Engl. Fl. p.* 18; *Müll. Syn. pt.* 1. *p.* 521.

In the fissures of rocks and on old walls, especially such as are calcareous; rare in fruit. Fr. Summer. This is the largest species of the genus, and when not in fruit may be distinguished by its lengthened stems and soft green leaves, which have an affinity with the Awl-shaped Screw Moss, *Tortula subulata.* The twisted capsule is a beautiful object, and the long red permanent segments of the peristome are a distinctly marked character. By recent writers on Bryology

an internal peristome of fine cilia has been described, which lengthen out into a reddish membrane.

2. ENCALYPTA VULGARIS, Hedw. (*Common Extinguisher Moss.*) Stem short; leaves oblongo-elliptical, obtuse, their nerve produced a little beyond the summit; capsule cylindrical, smooth; calyptra entire at the base.—*Eng. Fl. p.* 18; *Müll. Syn. pt.* 1. *p.* 516.

On banks and wall-tops; not so common in Scotland as in the south. Fr. March. Where this Moss is abundant it is readily detected by the pale green of its cylindrical calyptra, which adheres to it longer than in most other Mosses. The peristome however is fugacious in the same ratio, for unless examined when the lid is removed, its short segments fall off at once, or indeed adhere to the lid.

3. ENCALYPTA CILIATA, Hedw. (*Fringed Extinguisher Moss.*) Stems more or less elongated; leaves oblongo-acuminate, their nerve produced considerably beyond the point; capsule cylindrical, smooth; calyptra with a distinct fringe at the base.—*Eng. Fl. p.* 18; *Müll. Syn. pt.* 1. *p.* 519.

Moist rocks, and on the ground in mountainous districts. Fr. Summer. The fringe surrounding the base of the calyptra is a prominent feature in the fruit of this Moss: it does not seem to be a continuation of the calyptra, but is

set on to it by a connecting margin. Two varieties are enumerated by Sir W. J. Hooker.

Var. *concolor:* leaves apiculate, their points of the same colour.

Var. *pilifera:* leaves much acuminated, their points diaphanous. This seems to be the *E. commutata* of Nees, and *E. affinis* of Schwægrichen.

4. ENCALYPTA RHAPTOCARPA; Schwægr. (*Striated-fruited Extinguisher Moss.*) Stems more or less elongated; leaves oblong, apiculate, the points of the same colour; capsule cylindrical, sulcated; calyptra ciliated at the margin; cilia deciduous.—*Eng. Fl. p.* 18; *Müll. Syn. pt.* 1. *p.* 520.

Rocks near the summit of lofty mountains; Ben Lawers, and others of the Breadalbane range. Ben Bulben, near Sligo. Fr. Summer. This species has also a fringe at the base of the calyptra, which seems more delicate and fugacious than in the former species. The striæ or furrows of the capsule distinguish it from the two preceding, which it resembles much in general appearance. Ben Lawers is the station where we have gathered it in best condition, growing in crevices of rocks with other rare denizens of that richly botanical locality.

WEISSIA, Hedw. (WEISSIA.)

A genus instituted by Hedwig in memory of Weissius, Professor of Botany, "an intelligent and modest" investigator of the Cryptogamia of Göttingen. It has been much broken up by the authors of the valuable 'Bryologia Europæa,' and other recent writers, and we doubt not many of the modifications they adopt are well founded. We have however thought it best to adhere as strictly as possible to the nomenclature adopted in the 'English Flora' in this and other genera, recommending our muscological friends who may have access to these works to avail themselves of the ample stores of information they afford.

Generic Character.—Seta terminal. Peristome single, of sixteen nearly erect, entire, equidistant teeth. Apophysis none. Calyptra dimidiate.

* *Capsule drooping, gibbous.*

1. WEISSIA NUDA, Hook. and Taylor. (*Naked Weissia.*) Stems scarcely any; leaves ovato-lanceolate, nerveless; capsule ovate, cernuous, gibbous on one side.—*Eng. Fl. p.* 19. Discelium nudum, *Müll. Syn. pt.* 1. *p.* 149.

On clayey soil, near Manchester, Mr. Caley, and near Perth, Mr. Don. It is also found in the plains of other northern

countries of Europe, but nowhere common. Fr. August. The epithet *naked* is given to it from the comparatively small proportion of foliage attached to it. The stem and capsule are of a reddish colour.

2. WEISSIA NIGRITA, Hedw. (*Black-fruited Weissia.*) Stem elongated; leaves lanceolate, acuminated, nerved; capsule obovate, arcuato-cernuous, gibbous, furrowed; lid hemispherical, obtusely pointed.—*Eng. Fl. p.* 19. Catascopium nigritum, *Müll. Syn. pt.* 1. *p.* 510.

Moist banks on the mountains, on damp sandy spots in the plains; plentiful on Ben-y-glae, sands of Barrie, near Dundee, St. Andrews, Mr. Howie, Gullan Links, etc. Fr. August. The rounded, drooping, and black capsules traced with furrows, of this interesting Moss, distinguish it from all others. It is found in abundance on the Rocky Mountains of North America.

** *Capsule erect, or cernuous from the curvature of the seta, equal. Leaves ovate or lanceolate, nerved.*

3. WEISSIA ELONGATA, Hoppe and Hornsch. (*Elongated Weissia.*) Stems elongated, densely tufted; leaves closely imbricated, lanceolate-ovate, obtuse, reticulated, entire; nerve strong, reaching nearly to the point; seta flexuose, arched; capsule ovali-pyriform, the lid conical. — *Eng. Fl. p.* 19.

Miclichoferia nitida, *var.* elongata, *Müller, Syn. part* 1. *p.* 235.

Rocks above Loch Callater, Aberdeenshire, but not in fruit, Dr. Greville. The foliage of this Moss is very distinct, and we hope the fruit may yet be found in the locality mentioned, which is the direct route for the ascent of Lochnagar from Castleton of Braemar. It resembles some alpine *Bryums* a good deal, especially *B. julaceum.*

4. Weissia Starkeana, Hedw. (*Starkean Weissia.*) Stems very short; leaves ovate, with an excurrent nerve; capsule ovate, erect; lid conical; teeth of the peristome subulate, acute (mostly red).—*Eng. Fl. p.* 20. Pottia Starkeana, *Müll. Syn. pt.* 1. *p.* 547.

Banks and fields in the middle and south of Britain; dry banks near Dublin. Fr. February. The teeth of the peristome vary in length, and are sometimes latticed or lacunose.

5. Weissia affinis, Hook. and Taylor. (*Blunt-toothed Weissia.*) Stems very short; leaves ovate, with an excurrent nerve; capsule ovate, erect; lid conical; teeth of the peristome short, broad, obtuse, whitish.—*Eng. Fl. p.* 20. Pottia Starkeana, *var.* brachyodus, *Müll. Syn. pt.* 1. *p.* 547.

Fields and banks. Fr. January and February. Very closely allied to the last of which by recent authors it is

made a variety. The very short obtuse teeth are the chief distinction, and it is somewhat larger in size.

6. WEISSIA LANCEOLATA, Hook. and Taylor. (*Lance-leaved Weissia.*) Stems somewhat elongated; leaves ovate, with an excurrent nerve, almost piliferous; capsule ovate; lid obliquely rostrate.—*Eng. Fl. p.* 20. Pottia lanceolata, *Müll. Syn. pt.* 1. *p.* 548.

On moist banks. Fr. Spring. Also allied to *W. Starkeana*, but distinguished by its rostrate lid. It resembles some forms of *Gymnostomum truncatulum*, with which it may be remembered: it is now associated by recent authors in the genus *Pottia*.

7. WEISSIA LATIFOLIA, Schwægr. (*Broad-leaved Weissia.*) Stems unbranched, very short; leaves broadly obovate, with a small acumen, concave, imbricated, shining, the nerve reaching nearly to the point; capsule oblong, cylindrical, erect; lid rostrate.—*Eng. Fl. p.* 20. Pottia latifolia, *Müll. Syn. pt.* 1. *p.* 550.

In crevices of rocks on the Clova Mountains, Forfarshire, Mr. Drummond, 1824. Fr. August. Sufficiently distinguished by its broad imbricated leaves. We are not aware that it has been found in any other locality in Britain, but it is abundant on the Swiss Alps.

*** *Capsules erect, equal. Leaves linear or subulate (nerved).*

8. WEISSIA STRIATA, Hook. and Taylor. (*Striated Weissia.*) Leaves linear, denticulate, crisped when dry; capsule ovato-turbinate, sulcate, erect; lid obliquely subulate.—*Engl. Fl. p.* 21. W. fugax, *Müll. Syn. pt.* 1. *p.* 650.

Banks and crevices of rocks in alpine districts; on various Scotch mountains. Fr. August. There is a var. *major*, the *W. denticulata* of Schwægrichen, with leaves broadly linear and denticulate. This has been found on rocks by the river Isla in Forfarshire.

9. WEISSIA TRICHODES, Hook. and Taylor. (*Bristle-leaved Weissia.*) Stems scarcely any; leaves subulato-setaceous, entire; capsule ovate, striated; lid rostrate.—*Eng. Fl. p.* 21. Brachyodus trichodes, *Müll. Syn. pt.* 1. *p.* 416.

On granite or sandstone rocks, preferring such as are under a drip of water; near Henfield, Sussex, and near Manchester. Welsh and Scotch mountains. Fr. Feb. A minute species, apt to be overlooked as *W. pusilla*, or *Gymnostomum tenue*. The short and broad teeth of the peristome are very marked, whence its new generic name *Brachyodus* (Broad-tooth).

10. WEISSIA CIRRATA, Hedw. (*Curl-leaved Weissia.*)

Leaves broadly subulate, crisped when dry, their margins recurved; capsule ovate; lid rostrate.—*Eng. Fl. p.* 21. Blindia cirrhata, *Müll. Syn. pt.* 2. *p.* 416.

On posts and trees, thatched roofs, etc. Fr. Spring. Closely allied to *W. crispula*, from which it is distinguished by the character of its foliage.

11. WEISSIA TENUIROSTRIS, Hook. and Taylor. (*Slender-beaked Weissia.*) Stems loosely tufted, elongated; leaves linear-acuminate, grooved, flexuose, waved and plane at the margin; nerve opaque; capsule subobliquely cylindrical; lid rostrate, as long as the capsule.—*Eng. Fl. p.* 21. Trichostomum cylindricum, *Müll. Syn. pt.* 1. *p.* 586.

Moist rocks, Campsie, near Glasgow (in fruit), Powerscourt Waterfall near Dublin, and other places in Ireland, but barren. Fr. April. With much of the habit of *Tortula tortuosa*, but evidently the peristome is that of a *Weissia*.

12. WEISSIA CURVIROSTRA, Hook. and Taylor. (*Curved-beaked Weissia.*) Stems elongated, wiry (usually red); leaves patent, linear, subulate, margined with the revolute edge; nerve strong; capsule ovato-cylindrical; lid shortly rostrate, oblique; teeth of the peristome subulate, erect. —*Eng. Fl. p.* 22. Trichostomum rubellum, *Müll. Syn. pt.* 1. *p.* 581.

Moist banks, wall-tops, and rocks. Fr. September. A common but very beautiful Moss, with the habit of a *Tortula*. The leaves, from their strong nerve, have a very rigid appearance.

13. Weissia crispula, Hedw. (*Curled Weissia.*) Stems elongated, branched; leaves from a broad base, lanceolato-subulate, crisped when dry, their margins incurved; capsule ovato-elliptical; lid rostrate.—*Engl. Fl. p.* 22. Blindia crispula, *Müll. Syn. pt.* 2. *p.* 585.

On rocks in mountainous districts. Fr. May. Under *W. cirrata* we mentioned that this was a nearly allied plant. It is smaller however, and of a darker green, than that species.

14. Weissia contraversa, Hedw. (*Green Cushioned Weissia.*) Stems short, nearly simple; leaves linear-subulate, crisped when dry, the margins involute; capsule ovato-elliptical; lid rostrate.—*Eng. Fl. p.* 22. W. viridula, *Müll. Syn. pt.* 1. *p.* 651.

On banks, wall-tops, etc., where there is some degree of moisture; common throughout the country. Fr. Spring. As is generally the case with Mosses and other plants widely distributed, this species presents a good deal of variation in form, six of which varieties are described by recent authors. In speaking of *Gymnostomum microstomum*, we referred to

the great similarity between it and this Moss. In Africa, to which it extends, it fruits in September.

15. WEISSIA CALCAREA, Hedw. (*Chalk Weissia.*) Stems scarcely any; leaves subulate, erect, from a broad base, linear, obtuse, thick with a very broad nerve; capsule turbinate; lid rostrate.—*Eng. Fl. p.* 23. Seligeria calcarea, *Müll. Syn. pt.* 1. *p.* 419.

On the perpendicular faces of chalk cliffs and pits; in the south of England, abundant. Fr. May. A conspicuous little plant on Albion's white cliffs. It was found also by Hornschuch on the island of Rugen, in Germany.

16. WEISSIA RECURVATA, Hook. and Taylor. (*Recurved Weissia.*) Stems scarcely any; leaves subulate, erect; capsule broadly ovate; seta curved; lid rostrate.—*Eng. Fl. p.* 23. Seligeria recurvata, *Müll. Syn. pt.* 1. *p.* 419.

On limestone and sandstone rocks in the north of England, Wales, and Scotland. Brandon Hill, Ireland. Rare. Fr. June. It resembles *W. pusilla* much, with which it is often associated; but may be distinguished by its somewhat larger size and curved pedicel.

17. WEISSIA PUSILLA, Hedw. (*Dwarf Weissia.*) Stems scarcely any; leaves subulate, erect; capsule pyriform; seta always erect; lid rostrate.—*Eng. Fl. p.* 23. Seligeria pusilla, *Müll. Syn. pt.* 1. *p.* 418.

On shady rocks, chiefly such as are calcareous. The principal localities recorded are in the midland counties of England, and near Belfast.

18. WEISSIA VERTICILLATA, Schwægr. (*Whorled Weissia.*) Stems elongated, branched; leaves nearly erect, linear-subulate, with a strong nerve, dotted; capsule ovate; lid conico-acuminate.—*Eng. Fl. p.* 23; *Müll. Syn. pt.* 1. *p.* 656.

On dripping rocks, especially such as are in some degree calcareous, but not very common. We have gathered it in Berwickshire, and there are several stations recorded in Fife and the Lothians; Dargle river, Ireland. Fr. August. It is a neat and beautiful Moss, of a pale and bright green colour, and the lower branches are frequently covered with a white incrustation deposited from the dripping waters amid which it grows.

19. WEISSIA ACUTA, Hedw. (*Sharp-pointed Weissia.*) Stems branched; leaves subulato-setaceous, subsecund, rigid, canaliculate; capsule turbinate; lid rostrate.—*Eng. Fl. p.* 24. Blindia acuta, *Müll. Syn. pt.* 1. *p.* 342.

Moist alpine rocks, abundant. Fr. Summer. Even those botanists who are no muscologists can scarcely avoid meeting and admiring this interesting alpine Moss, as it decks the mountain's brow, associated with the wild flowers of summer, and the brown tints of its foliage present an

agreeable contrast to the patches of emerald green, amid which it often happens to vegetate.

GRIMMIA, *Ehrh.* (GRIMMIA.)

Named in honour of Dr. F. C. Grimm, a German botanist. "This genus bears the same relation to *Weissia* that *Trichostomum* does to *Didymodon;* its essential distinguishing character residing in the mitriform calyptra." Some species are of a peculiarly lurid blackish-green colour, and the foliage of others is marked by their long diaphanous points.

Generic Character.—Seta terminal. Peristome of sixteen entire or perforated, rarely cleft, equidistant teeth. Calyptra mitriform.

* *Fruit sessile, or nearly so.*

1. GRIMMIA APOCARPA, Hedw. (*Sessile Grimmia.*) Stems branched; leaves ovato-lanceolate, recurvo-patent, their margins reflexed, those of the perichætium having the nerve disappearing immediately below their summits; capsule ovate, sessile; lid shortly rostrate.—*Eng. Fl. p.* 24; *Müll. Syn. pt.* 1. *p.* 776. Schistidium *of Br. and Sch. and others.*

On rocks, stones, wall-tops, and trees, abundant. Fr.

Spring. A very common but most variable Moss, whence it has been called the "very Proteus" of the family. These varieties of form seem to depend a good deal on the locality in which the plants grow, and we note the following as the most distinct.

Var. *nigro-viridis*, or *rivularis:* stems more elongated and divided; leaves more broadly ovate, blackish-green. On rocks in moist places, or by the sides of streams, sometimes on trees. The bright red teeth of the peristome are beautiful objects in Spring.

Var. *stricta:* stems also elongated; leaves narrower. In subalpine districts.

Var. *conferta:* densely pulvinate; leaves oblong, lanceolate; lid shortly rostrate; teeth of the peristome orange. Rocks on the mountains, ascending to a considerable altitude. It is found in various localities on Arthur's Seat, close to Edinburgh.

Dr. Taylor, in the 'Flora Hibernica,' mentions a variety at the Dargle river, whose "capsules are higher than the perichætia."

2. GRIMMIA MARITIMA, Turn. (*Sea-side Grimmia.*) Stems short, pulvinate; leaves lanceolate, acuminate, nearly erect, crisped when dry, their margins recurved, those of the peri-

chætium with the nerve running beyond their summits; capsule ovate, sessile; lid shortly rostrate.—*Eng. Fl. p.* 24; *Müll. Syn. pt.* 1. *p.* 781.

On rocks by the sea-side. Fr. Spring. A good deal resembling the former species, but well distinguished by the form of its foliage, which is also crisped when dry. Bruch and Schimper inform us that the specimens from Norway and Lapland have less rigid foliage and less compact patches than those from the British shores.

** *Seta exserted, curved or geniculated.*

3. GRIMMIA SAXICOLA, Schwægr. (*Sandstone Grimmia.*) Stems scarcely any; leaves linear, subulate, crisped when dry; seta geniculated; capsule ovate; lid rostrate, straight. —*Eng. Fl. p.* 25. Campylostelium saxicola, *Müll. Syn. pt.* 1. *p.* 417.

Sandstone rocks; Blackdoun, Sussex, and near Lough Bray, in Ireland. It is also found in a few similar situations on the Continent. Fr. May. This is a very minute species, and liable to be mistaken for some of the smaller *Weissiæ.*

4. GRIMMIA PULVINATA, Sm. (*Grey Cushioned Grimmia.*) Stems short, pulvinate; leaves narrow-elliptical, their margins recurved, their points diaphanous, piliform; seta

curved; capsule ovate, striated; lid conical, acuminated.—*Eng. Fl. p.* 25; *Müll. Syn. pt.* 1. *p.* 783.

Abundant on wall-tops and rocks. Fr. Spring. The beautifully circular cushions formed by the short branches and hair-tipped foliage of this little Moss, can scarcely have been missed by the most casual observer of Nature's works. It is quite an evergreen, refreshed by every shower, hiding its capsules in Spring among the foliage till the spores are mature, and subsequently exposing their empty walls to the summer's sun.

5. GRIMMIA TRICHOPHYLLA, Grev. (*Hair-pointed Grimmia.*) Stems elongated, loosely tufted; leaves lax, waved, lanceolate, gradually tapering into a diaphanous point, their margins recurved; seta flexuose and curved; capsule elliptical-ovate, sulcate; lid rostrate.—*Eng. Fl. p.* 25; *Müll. Syn. pt.* 1. *p.* 785.

On stony ground, chiefly in the north. Near Dublin. Fr. April. First discovered by Dr. Greville on walls near Edinburgh, and fully described in his 'Scottish Cryptogamic Flora,' pl. 100. Its long stems have considerable resemblance to those of a *Trichostomum.*

It seems abundant in Sweden, and in regions still more distant from us.

Fitch, del et lith.

F. Reeve, imp.

6. GRIMMIA SPIRALIS, Hook. and Taylor. (*Spiral-leaved Grimmia.*) Stems elongated, pulvinate; leaves lanceolate, tapering into a diaphanous hair-like point, erect when moist, spirally twisted when dry; seta curved; capsule ovate, smooth.—*Eng. Fl. p.* 26; *Müll. Syn. pt.* 1. *p.* 789.

Alpine rocks, especially such as are dry and micaceous. Caldron Snout and Falcon Clints, Durham; Ben Lawers (abundant), and Clova, Scotland; Slemish Mountain, Ireland. Fr. September. Rocks in Teesdale, Durham, Spruce.

7. GRIMMIA TORTA, Hornschuch and Nees. (*Twisted-leaved Grimmia.*) Stems elongated, exceedingly densely pulvinate, of a very soft texture; leaves lanceolate, acuminate, the upper ones scarcely piliferous, all of them remarkably spirally twisted when dry.

Dry rocks at considerable altitudes on the Breadalbane Mountains; plentiful, but always without capsules. Very much in habit resembling *G. spiralis*, from which it is distinguished by its less rigid texture, and the rich brown colour of its leaves, which are paler towards the points.

**** Seta exserted, straight.*

8. GRIMMIA LEUCOPHŒA, Grev. (*Hoary Grimmia.*) Stems rather short, tufted; leaves elliptical, very hoary, with long piliferous points; seta a little longer than the

leaves; capsule ovate; teeth of the peristome often bifid and perforated; lid rostrate, short.—*Eng. Fl. p.* 26; *Müll. Syn. pt.* 1. *p.* 794.

On rocks; in Britain on those of trap formation. Arthur's Seat, Edinburgh; rocks on the coast of Fife; Fairhead, co. Antrim. Fr. April. A neat species, with elegant erect capsule. As Sir W. J. Hooker remarks, it has the leaves of *G. pulvinata*, and the capsule of *G. ovata*. It is one of the favourites we annually welcome in spring walks by Samson's Ribs to Duddingstone village by the southern base of Arthur's Seat, and the search for the capsules, which are by no means common, adds zest to the excursion.

A var. *subrotunda*, from New Holland, has been described by Mr. Wilson in 'London Journal of Botany' for 1846.

9. GRIMMIA OVATA, Web. and Mohr. (*Ovate Grimmia.*) Stems more or less elongated; leaves lanceolato-subulate, gradually produced into long diaphanous hair-like points, their margins recurved; seta exserted; capsule ovate; teeth of the peristome often perforated and split; lid rostrate.—*Eng. Fl. p.* 26; *Müll. Syn. pt.* 1. *p.* 796.

On rocks, chiefly in mountainous districts. Fr. June. This is a widely distributed and variable species, and three of these varieties have been described by continental authors.

10. GRIMMIA DONIANA, Sm. (*Donian Grimmia.*) Stems short; leaves lanceolato-subulate, produced into long diaphanous hair-like points, their margins incurved; capsule ovate; teeth of the peristome quite entire; lid shortly rostrate.—*Eng. Fl. p.* 27. G. obtusa, *Müll. Syn. pt.* 1. *p.* 796.

On alpine rocks. Fr. Summer. With much of the habit of *G. ovata,* than which it is much smaller and the teeth of its peristome are always quite entire.

11. GRIMMIA ATRATA, Miel. (*Black Tufted Grimmia.*) Stems elongated, very compact; leaves dense, erecto-patent, linear-lanceolate, rigid, obtuse, slightly keeled, destitute of hair-like points; capsule cylindrical; lid conical, with a short somewhat oblique thick beak; teeth narrow-lanceolate (yellow), marked with a line or occasionally split.—*Eng. Fl. p.* 27; *Müll. Syn. pt.* 1. *p.* 803.

Rocks above Glen Callater, Dr. Greville, 1830. Fr. Autumn (late). This distinct Moss was discovered in 1815, by Mielichofer, at Schwarzwand, among the Alps of Salzburg, and has been subsequently found on most of the mountain-ranges of Europe. We doubt not that it will yet be found in other localities amid *our* snow-capped mountains.

12. GRIMMIA UNICOLOR, Hook. (*Dingy Grimmia.*) Stems

elongated, slender, rather loosely tufted; leaves lax, erect, from a broad base, linear-lanceolate, rigid, obtuse, keeled upwards, destitute of hair-like points; capsule elliptical; lid with a subulate inclined beak; teeth narrow-lanceolate, red, entire.—*Eng. Fl. p.* 27; *Müll. Syn. pt.* 1. *p.* 793.

On the perpendicular face of an exposed rock above Bachnagairn, at the head of Clova. Discovered by Mr. T. Drummond. Fr. August. This is an elegant species, with much of the habit and appearance of some *Trichostomums*. It has also been found in Norway and Rhætia, where it grows on "moist rocks or such as are subject to frequent irrigation."

DIDYMODON, Hedw. (Didymodon.)

The teeth of the peristome of this genus approach in pairs, or are united at the base, whence the name, *twin-tooth*. The British species are allied on one hand to the *Weissiæ*, and on the other to the *Dicranæ*. By recent authors this genus has been almost entirely dispersed among others.

Generic Character.—Seta terminal. Peristome single, of sixteen or thirty-two teeth, approaching in pairs, or united at the base. Calyptra dimidiate.

1. DIDYMODON PURPUREUS, Hook. and Taylor. (*Purple Didymodon.*) Stems scarcely branched; leaves lanceolate, acuminate, carinated, their margins recurved, entire; capsule ovato-cylindraceous, oblique, substrumose, furrowed when dry; lid conical.—*Eng. Fl. p.* 28. Ceratodon purpureus, *Müll. Syn. pt.* 1. *p.* 646.

On the ground, moist banks, and turf-topped walls, abundant. Fr. Spring. The patches of this neat, though common Moss, adorn our banks with their bright green foliage and furrowed capsules during the early spring. It varies much, especially in the length of the stems, and is so common in the temperate and colder latitudes that Müller, in speaking of its *patria*, or native country, says, "It is the greatest cosmopolite of all the Mosses, inhabiting every region of the earth, created as it were to weary the Bryologist."

2. DIDYMODON INCLINATUS, Sw. (*Inclined-fruited Didymodon.*) Stems somewhat elongated; leaves bifarious, from a sheathing base, subulate; capsule ovate, inclined, smooth; lid conical.—*Eng. Fl. p.* 28. Distichium inclinatum, *Müll. Syn. pt.* 1. *p.* 41.

On mountain rocks where there is some moisture. On the sands of Barrie, near Dundee, Mr. Don. Fr. August.

Arranged by Müller in his natural family the *Distichiaceæ*, such as have the leaves bifarious, or in two rows. It is found, but not frequent, on the different mountain-ranges of Europe.

3. DIDYMODON NERVOSUS, Hook. and Taylor. (*Thick-nerved Didymodon.*) Leaves obovate, shortly apiculate, their nerve incrassated above; capsule ovate, erect; lid shortly rostrate.—*Eng. Fl. p.* 28. Trichostomum convolutum, *Müll. Syn. pt.* 1. *p.* 590.

On dry banks, wall-tops, etc., in the south of Britain and Ireland. Fr. Spring. "A gregarious and very minute species. Found throughout the south of Europe, and also at the Cape of Good Hope."

4. DIDYMODON FLEXIFOLIUS, Hook. and Taylor. (*Wavy-leaved Didymodon.*) Stems more or less elongated; leaves erecto-patent, oblongo-ovate, flexuose, strongly serrated at the point, the margin recurved below; capsule erect, cylindrical; lid rostrate.—*Eng. Fl. p.* 28. Trichostomum flexifolium, *Müll. Syn. pt.* 1. *p.* 577.

On sterile banks, moors, thatched roofs, and where heath has been burned. Fr. Spring. A pretty little Moss, with leaves of a pale yellow-green colour; various stations are given in the 'Muscologia Britannica.'

5. DIDYMODON GLAUCESCENS, Web. and Mohr. (*Glaucous Didymodon.*) Stems rather short, densely tufted, slightly branched; leaves linear-lanceolate, erecto-patent, acute, remarkably glaucous; capsule oblong, erect; lid conico-rostrate.—*Eng. Fl. p.* 29. Trichostomum gl., *pt.* 1. *p.* 569.

On the Clova Mountains, in Glen Phee, on rocks slightly covered with earth. Fr. August. Easily distinguished by its glaucous green foliage.

6. DIDYMODON BRUNTONI, Arn. (*Mr. Brunton's Didymodon.*) Stems elongated, pulvinate, branched; leaves lanceolato-subulate, the margins slightly recurved, scarcely serrated, twisted when dry; capsule erect, ovate; lid obliquely rostrate.—*Eng. Fl. p.* 29. Dicranum Bruntoni, *Müll. Syn. pt.* 2. *p.* 590.

Rocks in alpine districts; Pentland Hill, near Edinburgh; Aber, North Wales; Powerscourt Waterfall, Ireland. Fr. June. Has much of the habit of *Weissia crispula.*

7. DIDYMODON RIGIDULUS, Hedw. (*Rigid-leaved Didymodon.*) Stems elongated, branched; leaves lanceolate, carinate, tapering upwards to a narrow point, the margins reflexed, entire; nerve rigid, running beyond the point; capsule oblongo-ovate, erect; lid rostrate.—*Eng. Fl. p.* 29. Trichostomum rigidulum, *Müll. Syn. pt.* 1. *p.* 570.

On walls and rocks. Fr. September to March. Very much resembling *Tortula fallax*, so much so, that "it will require an experienced eye to distinguish it without having recourse to the peristome." A variety with cylindrical capsules has been found near Beaumaris, and at Dunkerron in Ireland.

8. DIDYMODON TRIFARIUS, Sw. (*Three-ranked Didymodon.*) Leaves rather distant, somewhat trifarious, lanceolate, obtuse, carinate, with the nerve scarcely reaching to the point; capsule oblongo-ovate, erect; lid rostrate.—*Eng. Fl. p.* 30. Trichostomum trifarium, *Müll. Syn. pt.* 1. *p.* 574.

On moist banks. Fr. Winter and early Spring. Nearly allied to the preceding species, from which it may be known "by the shorter, more patent, far less rigid, more distantly placed and trifarious leaves." It varies considerably in size.

9. DIDYMODON CRISPULUS. (*Obscure Didymodon.*) Stem short, scarcely branched; leaves erect, lanceolato-subulate, with entire and slightly incurved margins, channelled above, concave and rounded at the summit; nerve suddenly inflexed towards the apex and excurrent; capsule oblongo-ovate, erect; lid rostrate.—*Eng. Fl. p.* 30. Trichostomum crispulum, *Müll. Syn. pt.* 1. *p.* 571.

On maritime limestone rocks in Anglesea, and on Orme's

Head, Caernarvonshire, Mr. Wilson; rocks in co. Kerry, Ireland. Fr. May and June.

10. DIDYMODON BRACHYDONTIUS, Wils. MSS. (*Sharp-toothed Didymodon.*) Stems short, scarcely branched; leaves widely spreading, linear, with plane margins, bluntish, entire; the nerve excurrent and slightly recurved towards the apex; capsule oblong-ovate; lid rostrate; peristome very short.—*Engl. Fl.* p. 30. Trichostomum mutabile, *Müll. Syn. pt.* 1. *p.* 571.

In the same localities as the preceding species. Fr. June. Two Continental varieties of this species are enumerated by Müller, viz. *brevifolium* and *angustifolium*. Closely allied to the preceding. Both are found in the south of Europe, chiefly on rocks on the Mediterranean coast.

11. DIDYMODON CAPILLACEUS, Schrad. (*Fine-leaved Didymodon.*) Stems elongated, cæspitose; leaves nearly distichous, subulato-setaceous; capsule erect, ovato-cylindraceous; lid conical.—*Engl. Fl. p.* 30. Distichium capillaceum, *Müll. Syn. pt.* 1. *p.* 40.

Banks and rocks in mountainous districts; Ben Bulben, near Sligo. Fr. Spring. An elegant species, with stems varying in length according as it grows in wet or dry situations.

12. DIDYMODON LONGIROSTRIS? Web. and Mohr. (*Long-beaked Didymodon.*) Stems elongated, loosely cæspitose; leaves subulato-setaceous, falcato-secund; seta incurved, flexuose; capsule oblongo-cylindrical; lid rostrate.—*Eng. Flora, p.* 31. Dicranum denudatum, *Müll. Syn. part* 1. *p.* 403.

Moist shady rocks in alpine situations, but always barren. Ben-y-gloe and Cairngorum. We are not aware that the fruit of this Moss has yet been found in Britain, till which it must remain uncertain whether it is the true plant. It and its allies love to grow amid

> "Steep and lofty cliffs,
> That, in a wild, secluded scene, impress
> Thoughts of more deep seclusion."

13. DIDYMODON HETEROMALLUS, Hook. and Taylor. (*Curved-leaved Grimmia.*) Stems rather short; leaves subsecund, subulate; capsule ovato-cylindraceous; lid conical. —*Eng. Fl. p.* 31. Leptotrichum homomallum, *Müll. Syn. pt.* 1. *p.* 453.

On banks, wall-tops, and elsewhere, on sandy or clayey soil, especially in mountainous districts. Fr. Summer. This elegant Moss is found abundantly throughout Scotland, and will often meet the eye of the botanist, while he is in search

of flowering-plants, marked as it is by its crowded mode of growth, and pale green leaves.

14. DIDYMODON PUSILLUS, Hedw. (*Dwarf Didymodon.*) Stems slender, elongated; leaves erect, rigid, from a broad lanceolate base, subulate; capsule erect, oblong; lid obliquely rostrate.—*Eng. Fl. p.* 31. Leptotrichum tortile, *var.* pusillum, *Müll. Syn. pt.* 1. *p.* 454.

Sandy banks and garden-ground, near Belfast, Messrs. Templeton and Drummond. Much smaller than the last, which it much resembles in habit. It has upright and somewhat rigid leaves, and a peristome with short teeth. Found throughout Europe and North America.

15. DIDYMODON CYLINDRICUS. (*Cylindrical Didymodon.*) Stem short, simple; leaves from a broad base, setaceo-capillary, spreading on all sides, flexuose; capsule cylindrical, inclined; lid conical, blunt.—*Eng. Fl. p.* 32. Angstræmia cylindrica, *Müll. Syn. pt.* 1. *p.* 441.

On damp ground. Ditch-bank near Orange Grove, Belfast, Mr. Drummond. Fr. November. A very distinct species; it is found here and there throughout the north, and more sparingly in the middle of Europe, preferring subalpine districts.

TRICHOSTOMUM, *Hedw.* (FRINGE MOSS.)

This name is derived from two Greek words, signifying "hairy-mouthed," and few objects can be more worthy of admiration than the delicate teeth of the peristome. The species all grow on rocks and stones, and are almost entirely confined to the temperate zones.

Generic Character.—Seta terminal. Peristome single, of sixteen equal teeth, divided to the base, or thirty-two placed together in pairs. Calyptra mitriform.

* *Fruit-stalks curved.*

1. TRICHOSTOMUM PATENS, Schwægr. (*Spreading Fringe Moss.*) Stems elongated, procumbent; leaves lanceolate, acuminate, carinated, their margins recurved; fruit-stalks curved; capsule oblongo-ovate, furrowed; lid rostrate.—*Eng. Fl. p.* 32. Grimmia patens, *Müll. Syn. pt.* 1. *p.* 797.

Moist rocks on the mountains, frequent. Fr. Summer.

2. TRICHOSTOMUM FUNALE, Schwægr. (*Cord-like Fringe Moss.*) Stems elongated, ascending; leaves lanceolate, acuminate, carinated, their margins recurved, hair-pointed; fruit-stalks curved; capsule oblongo-ovate, furrowed; lid rostrate; teeth often cleft only at the point.—*Eng. Fl. p.* 32. Grimmia funalis, *Müll. Syn. pt.* 1. *p.* 799.

On rocks, lower down than the preceding. Fr. Summer. Nearly allied to the last, and in some respects resembling a *Grimmia*, in which genus it is classed by recent authors on Bryology. It is found by the Rev. J. S. Tozer, as far south as Plymouth and Penzance.

** *Fruit-stalks straight.*

† *Leaves with diaphanous points.*

3. TRICHOSTOMUM LANUGINOSUM, Hedw. (*Woolly Fringe Moss.*) Stems elongated, subpinnate; leaves lanceolato-subulate, acuminate, their long diaphanous points serrated; margins recurved; capsule ovate; fruit-stalks short, on lateral branches; lid rostrate.—*Eng. Fl. p.* 32. Grimmia lanuginosa, *Müll. Syn. pt.* 1. *p.* 806.

Stony ground on the mountains, fruiting more freely in the colder latitudes, and where there is some protection from woods. Fr. Spring. The appearance of this Moss is familiar to all who have trod "Caledonia's hills sublime." It is sometimes in such quantity as to exclude all other vegetation, forming an elastic grey carpet many acres in extent: such we have seen covering the massy shoulders of Ben Wyvis, in Ross-shire. In the calm of a summer day, in such localities,

"Your voice to whisper would have died
For the deep quiet's sake;
Your tread the softest Moss have sought
Such stillness not to break."

Unlike some of its allies, it is found widely distributed over the globe, having been found on the mountain-ranges of India and Australia.

4. TRICHOSTOMUM CANESCENS, Hedw. (*Hoary Fringe Moss.*) Stems elongated, irregularly branched; leaves ovato-lanceolate, their diaphanous acuminated points slightly serrated; capsule ovate; teeth of the peristome very long and filiform; lid subulate.—*Eng. Fl. p.* 33. Grimmia canescens, *Müll. Syn. pt.* 1. *p.* 807.

Stony grounds, in subalpine districts, frequent. Fr. Spring. This is also a common, but elegant species, with hoary foliage; it is found more frequently than the preceding in the lowland districts. There is a var. *ericoides*, with numerous fasciculate branches and somewhat squarrose leaves, which has been described by some authors as a species.

5. TRICHOSTOMUM HETEROSTICHUM, Hedw. (*Serrated Hoary Fringe Moss.*) Stems elongated, branched; leaves ovato-lanceolate, their diaphanous points slightly serrated; capsule cylindrical; teeth of the peristome rather short;

lid rostrate.—*Eng. Fl. p.* 33. Grimmia heterosticha, *Müll. Syn. pt.* 1. *p.* 807.

Stony ground, chiefly in mountainous districts. Fr. Spring. The general appearance of this species is that of the preceding, from which it is mainly distinguished by the shorter teeth of the peristome and the more cylindrical capsule.

6. TRICHOSTOMUM MICROCARPUM, Hedw. (*Small-fruited Hoary Fringe Moss.*) Stems elongated, branched; leaves lanceolate, their diaphanous acuminated points slightly serrated; capsule ovate; teeth of the peristome rather short; lid rostrate.—*Eng. Fl. p.* 33. Grimmia microcarpa, *Müll. Syn. pt.* 1. *p.* 804.

On rocks. Fr. Autumn and Spring. Allied to *T. heterostichum*, from which it is distinguished by having fasciculated stems, and by its capsules being much smaller and thinner in substance.

†† *Leaves never diaphanous at the points.*

7. TRICHOSTOMUM ACICULARE, Beauv. (*Dark Mountain Fringe Moss.*) Stems elongated, branched; leaves lanceolate, obtuse, serrulate at the points, their nerve vanishing before the summit; capsule oblong; lid rostrate.—*Eng. Fl. p.* 34. Grimmia acicularis, *Müll. Syn. pt.* 1. *p.* 801.

On wet rocks, especially in the course of mountain rivulets. Fr. Spring. Easily distinguished by its obtuse foliage, which is almost black when growing under water. A variety *denticulata* has been described, with the leaves more spreading and remotely toothed.

8. TRICHOSTOMUM FASCICULARE, Schrad. (*Beardless Hoary Fringe Moss.*) Stems elongated, branched; leaves lanceolate, entire, their summits never diaphanous, their margins recurved; capsule ovato-oblong; lid rostrate.—*Eng. Fl. p.* 34. Grimmia fascicularis, *Müll. Syn. pt.* 1. *p.* 809.

Moist rocks, in alpine and subalpine districts. Fr. Spring. "The acute, entire leaves, and brighter yellowish-green colour of this plant, distinguish it easily from the preceding." From *T. canescens* it is known by the leaves wanting the diaphanous points. It does not seem to be so common on the Continent as in Britain.

9. TRICHOSTOMUM POLYPHYLLUM, Schwægr. (*Many-leaved Fringe Moss.*) Stems tufted, branched; leaves lanceolato-subulate, their margins recurved, serrated above, very much crisped when dry; capsule oblong; lid rostrate.—*Eng. Fl. p.* 34. Brachystelium polyphyllum, *Müll. Syn. pt.* 1. *p.* 767.

Walls and rocks, especially of trap, in subalpine districts. Fr. Spring. Very different in appearance from all the

Grimmia apocarpa

Grimmia pulvinata.

Gymnostomum ovatum.

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other species, being distinguished by compact and regular tufts of dark green foliage. The pale capsules, with the bright red teeth of the peristome, are beautiful objects when just matured. The calyptra is that of *Glyphomitrion*, whence a specific synonym, "*glyphomitrioides.*"

10. TRICHOSTOMUM ELLIPTICUM, Hook. and Taylor. (*Elliptical Fringe Moss.*) Stems short, nearly simple; leaves lanceolate, acuminate, straight, their nerve broad, their margins plane; capsule elliptical; lid rostrate.

Alpine rocks, Scotland; Fairhead, co. Antrim, Ireland; Wales. Fr. Spring. It has somewhat the appearance of *T. aciculare.* Found also in Norway.

GLYPHOMITRION, *Brid.* (GLYPHOMITRION.)

The calyptra is furrowed or sculptured, whence the name, of Greek derivation. Allied to *Orthotrichum.*

Generic Character.—Seta terminal. Capsule without an apophysis. Peristome single, of sixteen teeth, approximated in pairs, reflexed when dry. Calyptra furrowed, covering the whole capsule, split at the base.

1. GLYPHOMITRION DAVIESII, Brid. (*Davies's Glyphomitrion.*) Stems fastigiate; leaves lineari-lanceolate, their

margins recurved, concave; capsule turbinate.—*Eng. Fl. p.* 35; *Müll. Syn. pt.* 1. *p.* 766.

On rocks, generally near the sea-shore, and such as are of trap formation. Discovered in Wales by Mr. Davies, and subsequently found in various localities in the west coast of England and Scotland; Giants' Causeway and Fairhead, in the north of Ireland, and near Bantry in the south. Fr. Spring. Smaller, but otherwise much resembling in habit *Trichostomum polyphyllum*. It has not yet been discovered elsewhere than in the British Isles.

2. GLYPHOMITRION CYLINDRACEUM, Taylor. (*Cylindrical Glyphomitrion.*) Stems fastigiate; leaves ovato-lanceolate, carinate, their margins recurved; capsule ovato-cylindraceous.—*Fl. Hibernica, pt.* 2. *p.* 21.

In the crevices of siliceous sandstone rocks, on Blackwater Hill, co. Kerry. A fuller description of this Moss will be found in the work we refer to.

DICRANUM, *Hedw.* (FORK MOSS.)

This name in Greek signifies *flesh-hook*, or *fork*, from a supposed resemblance of its forked teeth to that instrument; the bright red colour of these appendages however reminds

us more of flesh. A genus composed very arbitrarily of two extremely natural sections: comprising in the first section the genus *Fissidens* of Hedwig, the character of whose foliage at once distinguishes it from the succeeding section. The authors of the 'Muscologia Britannica' were so well aware of this, that they "were almost tempted to deviate from the Linnæan rule of drawing the generic distinctions from the fructification, and to employ those solely founded on the difference of foliage." This has been done more or less in all recent works on Bryology, and we concur in such improvements; but, for the reasons we have given elsewhere, we retain the arrangement we have referred to.

Generic Character.—Seta terminal (except in *D. adiantoides* and *taxifolium*). Peristome single, of sixteen bifid, equidistant teeth. Calyptra dimidiate.

A. *Leaves bifarious* (Fissidens).

1. DICRANUM BRYOIDES, Sw. (*Lesser Pinnate-leaved Fork Moss.*) Seta terminal; leaves of the perichætium resembling those of the stem.—*Eng. Fl. p.* 35. Fissidens bryoides, *Müll. Syn. pt.* 1. *p.* 58.

Moist banks, sides of ditches, and in woods, frequent. Fr. Winter. A small but variable species. We enumerate four varieties.

Var. *osmundoides* (*F. osmundoides*) of Hedw. and others: stem elongated, somewhat branched; capsule erect. On moist rocks.

Var. *incurvus* (*F. incurvum*, Schwæg.): stem short, simple; capsule inclined.

Var. *fontanum* (*F. crassipes*, Wils. MS.): stem longer and more robust; leaves subobcordate, very broad. On stones slightly immersed in water, near Orford Mount, Warrington.

Var. *Bloxami* (*F. Bloxami*, Wils. in Lond. Journ. of Bot. 1845, p. 195): very minute; stem simple; leaves remote, spreading, their margins crenulate, mouth of capsule provided with an annulus; lid obliquely subulate, about the length of the capsule. Found by the Rev. A. Bloxam, near Twycross in Leicestershire, and since in various other localities.

We doubt not there are many of our readers acquainted with this little Moss, whose small plume-shaped branches, frequently of a deep metallic-green colour, are seen reviving under the influence of Autumn's showers, on almost every shaded clayey bank, as it seems to shun spots that are much exposed to the light. The interest is increased when, towards the close of winter, its dark green capsules throw

off the protecting lid, and display the bright red peristome closing or expanding according to the state of the atmosphere. Its connection with an interesting adventure in the travels of Mungo Park, the African traveller, is so trite, that we only refer to it in passing. We trust however that the lesson of patient endurance, and trust in a heavenly Father's care, with which he was inspired while he surveyed this humble plant, on the sultry soil of Africa, will not be lost on our young readers. It is but few, comparatively, who are exposed to the trials and privations he encountered; yet in every difficulty let us remember that we are ever under the protecting care of Him, without whom a sparrow cannot fall to the ground, and by whom the hairs of our head are all numbered.

"Sad, faint, and weary, on the sand
Our traveller sat him down; his hand
Covered his burning head.
Above, beneath, behind, around,
No resting for the eye he found,
All nature seem'd as dead.

"One tiny tuft of Moss alone,
Mantling with freshest green a stone,
Fixed his delighted gaze;

Through bursting tears of joy he smiled,
And while he raised the tendril wild,
His lips o'erflow'd with praise.

"Oh! shall not He who keeps thee green,
Here in the waste, unknown, unseen,
Thy fellow-exile save?
He who commands the dew to feed
Thy gentle flower, can surely lead
Me from a scorching grave."

By another poet he is thus made to express himself:—

"Thy tender stalks, and fibres fine,
Here find a shelter from the storm:
Perhaps no human eye but mine
Ere gazed upon thy lovely form.
He that form'd thee, little plant,
And bade thee flourish in this place,
Who sees and knows my every want,
Can still support me with his grace."

2. DICRANUM ADIANTOIDES, Sw. (*Adiantum-like Fork Moss.*) Seta lateral; perichætial leaves ovate, slightly convolute, pointed.—*Eng. Fl. p.* 36. Fissidens adiantoides, *Müll. Syn. pt.* 1. *p.* 51.

Moist banks, dripping rocks, and bogs. Fr. Spring. A large and elegant species. As it is later in fruiting, its capsules will often be found in fine condition by the botanist in search of flowering-plants.

3. DICRANUM TAXIFOLIUM, Sw. (*Yew-leaved Fork Moss.*) Seta arising from the root; perichætial leaves ovate, sheathing, convolute, pointed.—*Eng. Fl. p.* 36. Fissidens taxifolius, *Müll. Syn. pt.* 1. *p.* 50.

Moist banks, preferring a clayey soil. Fr. Winter. In colour and habit a good deal resembling *D. bryoides*, from which it is distinguished by its lateral seta and curved capsule.

Fissidens polyphyllus, Wils. MS., found near Beddgelert, in Wales, by Mr. Wilson, is recorded and described as a species in 'Bryologia Europæa,' Suppl. tab. iii. It is large, and nearly allied to *F. adiantoides*, of which Müller makes it a var. (*Müll. Syn. pt.* 1. *p.* 51.)

B. *Leaves inserted on all sides of the stem.*

a. *Leaves destitute of nerve.*

4. DICRANUM GLAUCUM, Hedw. (*White Fork Moss.*) Stems branched, fastigiate; leaves lanceolate, straight, nerveless, entire; capsule ovate, cernuous; lid rostrate.—*Eng. Fl. p.* 37. Leucobryum vulgare, *Müll. Syn. pt.* 1. *p.* 74. Oncophorus glaucus, *Br. and Sch. p.* 5. *t.* 1, 2.

In moist ground, on heaths, in bogs, and on decaying wood, rare in fruit. Fr. Winter and Spring. The pale glaucous colour and cellular structure of this Moss at once

mark it distinctly. It is placed by Müller in the natural family *Leucobryaceæ*, and he says, in viewing the leaves at an acute angle the prismatic colours are developed.

b. *Leaves furnished with a nerve.*

* *Leaves apiculate, or piliferous.*

5. DICRANUM LATIFOLIUM, Hedw. (*Broad-leaved Fork Moss.*) Stems short; leaves oblong, concave, entire, apiculate, or piliferous; capsule erect, ovato-oblong; lid rostrate. —*Eng. Fl. p.* 37. Trichostomum latifolium, *Müll. Syn. pt.* 1. *p.* 588.

Banks in Ireland, four miles from Dublin, on the road to Woodlands; near Aberfeldy, Scotland. Fr. Summer. Found throughout Europe, in subalpine districts. Sometimes quite piliferous.

** *Leaves not apiculate.*

† *Nerve very broad.*

6. DICRANUM LONGIFOLIUM, Hedw. (*Long-leaved Fork Moss.*) Stems elongated; leaves very long, subulato-setaceous, falcato-secund, serrulate, their nerve very broad; capsule oblongo-ovate, nearly erect; lid rostrate.—*Eng. Fl. p.* 37; *Müll. Syn. pt.* 1. *p.* 374.

On Ben Voirlich and Ben-y-gloe, Scotland; wet rocks, Glenmalur, co. Wicklow, Ireland. Fr. Autumn. The fruit,

we believe, has not been found in Britain, and is rare on the Continent.

7. DICRANUM CERVICULATUM, Hedw. (*Red-necked Fork Moss.*) Stems short; leaves lanceolato-subulate, entire, subsecund, their nerve very broad; capsule ovate, subcernuous, strumose; lid rostrate.—*Eng. Fl. p.* 47. Angstræmia cerviculata, *Müll. Syn. pt.* 1. *p.* 430.

Moist banks and heaths, sides of drains, etc. Fr. June. Of a yellowish colour, growing in dense tufts.

8. DICRANUM FLEXUOSUM, Hedw. (*Zigzag Fork Moss.*) Stems nearly simple, rigid; leaves lanceolato-subulate, much acuminated, straight, their nerve very broad; seta flexuose; calyptra fringed at the base; capsule ovate, at length striated; lid rostrate.—*Eng. Fl. p.* 38; *Müll. Syn. pt.* 1. *p.* 400.

On turf bogs, and wet rocks. Fr. Winter. This species varies considerably; when growing on the low ground it is generally barren, and the leaves fall off in great quantities, whence a synonym, *Bryum fragile.* On higher ground it is blacker in colour, and the leaves are diaphanous at the points.

†† *Nerve narrow.*

* *Capsule with a struma.*

9. DICRANUM VIRENS, Hedw. (*Green Spur-fruited Fork*

Moss.) Stems elongated; leaves from a broad sheathing base, subulate, their margins recurved, crisped when dry, pointing in all directions; capsule smooth, oblongo-cylindrical, subcernuous, strumose; lid rostrate.—*Eng. Fl. p.* 38. Angstrœmia virens, *Müll. Syn. pt.* 2. *p.* 609.

Marshy ground, on mountains; Ben Lawers. Fr. June.

10. DICRANUM SCHREBERIANUM, Hedw. (*Schreberian Fork Moss.*) Stems rather short, simple, tufted; leaves squarrose, from a very broad sheathing base, suddenly subulate, crisped when dry; capsule ovate, subcernuous; struma distinct; lid rostrate, curved.—*Engl. Fl. p.* 38. Angstrœmia Schreberi, *Müll. Syn. pt.* 1. *p.* 439.

On the ground in Glen Tilt, at the foot of Ben-y-gloe, in Perthshire. Hooker and Greville, 1822. Fr. August. "This has the mode of growth of *D. varium*, and the squarrose foliage of *D. squarrosum;*" the whole plant however is smaller, and the capsule is distinctly strumiferous.

11. DICRANUM STRUMIFERUM, Ehrh. (*Strumose Fork Moss.*) Stems elongated; leaves from a broad sheathing base, subulate, entire, their margins plane, crisped when dry, pointing in all directions; capsule furrowed, oblong-ovate, subcernuous, strumose; lid rostrate.—*Eng. Fl. p.* 39; *Müll. Syn. pt.* 2. *p.* 592.

Marshy ground on the mountains. Fr. Autumn. The plane margin of the leaf and the shorter furrowed capsule, are the chief marks of distinction between this and the preceding. Allied to *D. virens*.

12. DICRANUM POLYCARPON, Ehrh. (*Many-headed Fork Moss.*) Stems elongated, branched; leaves patent, pointing in all directions, lanceolato-subulate, their margins recurved, flexuose, subserrulate, crisped when dry; capsule oblongo-ovate, nearly erect, furrowed when old; struma inconspicuous; lid rostrate.—*Eng. Fl. p.* 39; *Müll. Syn. pt.* 2. *p.* 591.

Alpine rocks, rare; Ben High, Aberdeenshire. Fr. August. Sir W. J. Hooker is inclined to reduce this species to *D. strumiferum*, and some recent writers take the same view of it.

13. DICRANUM FALCATUM, Hedw. (*Sickle-leaved Fork Moss.*) Stems nearly simple; leaves long, lanceolato-subulate, falcato-secund, nearly entire; capsule ovate, subcernuous, strumose; lid rostrate.—*Eng. Fl. p.* 39; *Müll. Syn. pt.* 1. *p.* 364.

Alpine rocks. Fr. June. Much like *D. heteromallum*, than which it is more rigid, with falcate leaves.

14. DICRANUM STARKII, Web. and Mohr. (*Starkian*

Fork Moss.) Stems somewhat branched, lanceolato-subulate, falcato-secund, entire; capsule oblongo-ovate, suberect, strumose; lid rostrate.—*Eng. Fl. p.* 39; *Müll. Syn. pt.* 1. *p.* 364.

Alpine rocks. Fr. July. This species much resembles the former, but the present plant is larger, with a longer capsule. In this, as in *D. scoparium*, we find a perichætium with convolute leaves.

** *Capsule without a struma.*

15. DICRANUM FLAVESCENS, Sm. (*Yellowish Fork Moss.*) Stems branched; leaves long, lanceolate, serrulate, pointing in all directions, crisped when dry; capsule oblong, erect; lid rostrate.—*Eng. Fl. p.* 40. Angstrœmia pellucida, *var.* serrata, *Müll. Syn. pt.* 2. *p.* 606.

On wet sandy spots on the banks of rivers. Fr. August.

"No brighter hue of verdure follows thy lonely way."

16. DICRANUM SQUARROSUM, Schrad. (*Drooping-leaved Fork Moss.*) Stems somewhat branched; leaves from a broad sheathing base, lanceolate, obtuse, recurved and patent, directed to every side, crisped when dry; capsule ovate, subcernuous; lid rostrate.—*Eng. Fl. p.* 40. Angstrœmia squarrosa, *Müll. Syn. pt.* 1. *p.* 438.

Wet spongy spots on the mountains, especially at the fountain-head of streams; rare in fruit. Fr. Summer and Autumn. By some authors it is placed in the strumiferous section—or genus *Oncophorus*,—but this structure is very obscure in it.

"Parching summer hath no warrant
To consume this crystal well:
Rains that make each rill a torrent
Neither sully it nor swell."

17. DICRANUM PELLUCIDUM, Sw. (*Pellucid Fork Moss.*) Stems branched; leaves lanceolate, their margins slightly waved, serrated, rather obtuse, pointing in all directions; capsule ovate, subcernuous; lid rostrate.—*Eng. Fl. p.* 40. Angstræmia pellucida, *Müll. Syn. pt.* 1. *p.* 606.

Sides of streams and rivers. Fr. Autumn. Resembling *D. flavescens*, from which it is distinguished by its more ovate, shorter, and inclined capsules.

18. DICRANUM SPURIUM, Hedw. (*Spurious Fork Moss.*) Stems elongated; leaves ovate, concave, erecto-patent, directed to every side, the upper ones lanceolate, serrulate; capsule oblong, curved; lid rostrate.—*Eng. Fl. p.* 40; *Müll. Syn. pt.* 1. *p.* 356.

On moist sandy and gravelly heaths, and in bogs; York-

shire; and Kinnordy in Scotland. Fr. Spring. Unknown, we believe, in Britain.

19. DICRANUM CRISPUM, Hedw. (*Curl-leaved Fork Moss.*) Stems short; leaves from a sheathing base, setaceous, nearly distichous, flexuose, recurved, crisped when dry; capsule ovate, erect; lid with a long beak.—*Eng. Fl. p.* 41. Angstrœmia crispa, *Müll. Syn. pt.* 1. *p.* 439.

On moist banks and similar localities in mountainous districts. Fr. November. With a great resemblance to *D. Schreberianum*, this species may be distinguished by its shorter and wider leaves, inclined capsule, and shorter lid.

20. DICRANUM FLAGELLARE, Hedw. (*Upright-fruited Fork Moss.*) Stems branched; leaves subulate, their margins plane, subserrated, more or less crisped when dry; capsule cylindrical, nearly erect, equal; lid with a very long beak; leaves falcato-secund.—*Eng. Fl. p.* 41; *Müll. Syn. pt.* 1. *p.* 381.

On rocks and stones in woods, especially in the south of Ireland, and there rare. Fr. September. A variety with leaves *directed to all sides*, the *D. Scottianum* of the 'Muscologia Hibernica,' is also found in the south of Ireland, and in Wales.

21. DICRANUM UNDULATUM, Ehrh. (*Waved-leaved Fork*

Moss.) Stems elongated; leaves nearly plane, lanceolate, attenuate, serrulate at the points, transversely waved; capsule cylindraceous, cernuous; lid with a long beak.—*Eng. Fl. p.* 41; *Müll. Syn. pt.* 1. *p.* 355.

In woods, and on rocks and boggy ground. Fr. August. The transverse undulations of the leaf are best seen when the plant is in a recent state. Sometimes two, three, or more setæ arise from one perichætium of this Moss, whence one of its synonyms, *D. polysetum.*

22. DICRANUM SCOPARIUM, Hedw. (*Broom Fork Moss.*) Stems elongated; leaves narrow, subulate, canaliculate, secund; capsule cylindraceous, arched, cernuous; lid with a long beak.—*Eng. Fl. p.* 41; *Müll. Syn. pt.* 1. *p.* 359.

In woods, copses, and less frequently on the ground. Fr. August. Two varieties are described by Sir W. J. Hooker, and are regarded as species by some authors.

Var. *majus* (*D. majus*, Turn.): stems more elongated; leaves more falcate and larger.

Var. *fuscescens* (*D. congestum*, Schwægr.): smaller in every part; leaves subsecund, narrower, somewhat crisped when dry.

Excepting some of the commoner *Hypnums*, few species of Mosses are more likely to catch the eye of the botanical

rambler in a woodland walk than this elegant plant; and as its capsules are mature in the end of summer, when the sylvan shade is on many accounts grateful, these will help to discover its whereabouts. It is very generally distributed over the globe, and, like all such, is subject to considerable variation.

"How glorious are the summer woods,
Where the bright Broom Fork-moss grows,
With their gush of love-born melody,
And their world of verdant boughs!"

23. DICRANUM VARIUM, Hedw. (*Variable Fork Moss.*) Stems short; leaves narrow, hastato-lanceolate, pointing in all directions; capsule ovate; lid rostrate.—*Eng. Fl. p.* 42. Angstrœmia varia, *Müll. Syn. pt.* 1. *p.* 436.

On damp and bare clayey soil, and moist banks. Fr. Winter. A neat little species, common throughout the country. The two species noted underneath have been described as species by some authors.

Var. *rufescens:* leaves subsecund, lanceolato-subulate, reddish; capsules erect.

Var. *luridum:* leaves subsecund, subulate, of a lurid colour; capsules subcernuous.

24. DICRANUM HETEROMALLUM, Hedw. (*Silky-leaved*

Hookeria lucens.

Gymnostomum truncatum.

Hedwigia aestiva.

Hypnum dendroides.

Fitch lith. V.Brooks imp.

Fork Moss.) Stems branched; leaves subulate, falcato-secund, nearly entire; capsule ovate, subcernuous; lid with a long beak.—*Eng. Fl. p.* 42. Angstrœmia heteromalla, *Müll. Syn. pt.* 1. *p.* 432.

Shaded banks and rocks, especially in a sandy soil. Fr. Autumn and Winter. The contrast between the bright green leaves and reddish-brown capsules renders it a beautiful object. The species *D. orthocarpum* and *interruptum* of Hedwig, are enumerated as varieties in recent works.

25. DICRANUM SUBULATUM, Hedw. (*Awl-leaved Fork Moss.*) Stems branched; leaves from a broad sheathing base, subulato-setaceous, secund, entire; capsule ovate, subcernuous; lid with a long beak.—*Eng. Fl. p.* 43. Angstrœmia subulata, *Müll. Syn. pt.* 1. *p.* 433.

On micaceous and sandy soil in subalpine districts. Fr. Autumn. Allied to the preceding species, from which it is distinguished by the broad and sheathing base of the leaves.

26. DICRANUM FULVELLUM, Sm. (*Tawny Fork Moss.*) Stems rather short, thickly tufted, simple; leaves subulato-setaceous, scarcely secund, those of the perichætium convolute; seta hardly longer than the leaves; capsule erect, turbinate, furrowed when old; lid conico-rostrate.—*Eng. Fl. p.* 43; *Müll. Syn. pt.* 1. *p.* 371.

Crevices of rocks and damp spots, near the summits of our loftiest mountains, Ben More, Ben Nevis, Ben Lawers, and more frequently on the Clova range in Scotland; summit of Snowdon. Fr. Autumn. From the localities recorded, it will be seen that this is a strictly alpine Moss, whose delicate leaves and frail capsules seem scarcely fitted to resist a passing breeze. Yet there, on these mountain solitudes, they stand unscathed, yea fostered and matured, by the

"Arrowy sleet,
Skin-piercing volley, blossom-bruising hail."

This species is so like *Weissia acuta* in appearance, that it was mistaken for it in the first edition of the 'Muscologia Britannica.' It is found on the Norwegian and other Alps of Northern Europe.

TORTULA, *Hedw.* (Screw Moss.)

Named so by Hedwig, on account of the curiously "*tortuous*," or "*twisted*" peristome. This name having been applied to a genus of flowering-plants, Hedwig changed the name to *Barbula*, which is still adopted by many foreign Muscologists.

There is a monograph of the genus by Hooker and Greville, in Brewster's Journal of Science, vol. i.

Generic Character.—Seta terminal. Peristome single, of thirty-two spirally twisted teeth, united more or less at the base into a tubular membrane, and, with scarcely an exception, turning from left to right. Calyptra dimidiate.

* *Leaves thick and rigid.*

1. TORTULA ENERVIS, Hook. and Greville. (*Nerveless Rigid Screw Moss.*) Stems very short; leaves few, lingulate, very obtuse, concave, nerveless, rigid, the margins involute; lid conico-acuminate, rather shorter than the oblong capsule.—*Eng. Fl. p.* 43. Barbula rigida, *Müll. Syn. pt.* 1. *p.* 596.

Walls and clay-banks; south of England. In several stations round Edinburgh, frequently associated with *Gymnostomum ovatum*. Fr. October to December. Two varieties are recorded from the south of Europe, viz. *mucronulata* and *brevipila*.

2. TORTULA BREVIROSTRIS, Hook. and Greville. (*Short-beaked Rigid Screw Moss.*) Stems very short; leaves few, obtuse, concave, nerveless, rigid, the margins involute; lid conical, scarcely beaked, half the length of the oblong capsule.—*Eng. Fl. p.* 43; *Müll. Syn. pt.* 1. *p.* 597.

On an old wall near Edinburgh, D. Stewart, Esq. Fr. October to December. Much like the preceding; and specimens which we gathered in the same locality some years after Mr. Stewart's discovery, vary considerably from the above description. Recent investigations show that the inflorescence is hermaphrodite.

3. TORTULA RIGIDA, Turn. (*Aloe-like Rigid Screw Moss.*) Stem very short; leaves few, linear, incurved, submucronulate, grooved, nerved, rigid, the margins involute; lid rostrate, about half the length of the oblong capsule.—*Eng. Fl. p.* 43. Barbula aloides, *Müll. Syn. pt.* 1. *p.* 596.

On clay-banks in the south of England and other districts; near Dublin, and in other parts of Ireland. Fr. November. From the shorter and less twisted peristome of this species, it has been described as a *Trichostomum* (*T. aloides*).

In our examination of the various species and varieties of the three preceding species, we are much disposed to concur in the opinion expressed by the talented author of the "Musci," in the 'Flora Hibernica,' who says, with reference to them, "So variable in the breadth of the leaves, the breadth of the nerves, which are sometimes concealed by the involute edges of the leaves, and by the length of the ros-

trum of the lids, that I feel the greatest difficulty in comprehending the *T. enervis* and *T. brevirostris* of authors." Accordingly he only records *T. rigida*.

They have always been favourite Mosses with us, for nothing can be more simply neat than their smoothly polished and nicely curved leaves, each tuft crowned with a seta and capsule. We should like much if some of our fair friends skilled in the mysteries of wax-flower manufacture would try their hand on a patch of the thick-leaved *Tortulæ*, for the leaves have a consistence suited to make them subjects of such an experiment.

** *Leaves more or less membranous.*

† *Perichætial leaves convolute, sheathing.*

4. TORTULA CONVOLUTA, Sw. (*Convolute Screw Moss.*) Stems rather short; leaves oblongo-lanceolate, acute, their margins plane, those of the perichætium remarkably involute; capsule oblong; lid rostrate.—*Eng. Fl. p.* 44. Barbula convoluta, *Müll. Syn. pl.* 1. *p.* 615.

Banks, and on moist clayey soil. Fr. Spring. The convolution of the perichætial leaves is a very marked character.

5. TORTULA REVOLUTA, Brid. (*Revolute Screw Moss.*) Stems short; leaves lanceolate, acute, their margins remarkably revolute, those of the perichætium sheathing, involute;

capsule oblong; lid rostrate, shorter than the capsule.—*Eng. Fl. p.* 44. Barbula revoluta, *Müll. Syn. pt.* 1. *p.* 621.

Banks, walls, and stones, in shady places. Fr. Spring. Not very generally distributed on the continent of Europe.

†† *Leaves uniform.*

6. Tortula muralis, Hedw. (*Wall Screw Moss.*) Stems mostly short; leaves patent, narrow, oblong, the margins recurved, the nerve strong, running out into a hair-like point; capsule oblongo-cylindrical; lid conical, acuminate. —*Eng. Fl. p.* 44. Barbula muralis, *Müll. Syn. pt.* 1. *p.* 625.

Wall-tops, stones, and rocks; very common. Fr. April. The little hair-tipped leaves of this common Moss are so abundantly distributed over every wall, that it seems superfluous to draw the attention of the most cursory observer to them. Their minute spores would seem to be vegetating ere the mortar has dried on the wall-top; and it seems, like the domestic sparrow, to love the society of man, as tiny tufts seem to be the last form of mossy vegetation that yields to the influence of the smoke of towns. It seems to be equally common throughout all the temperate zones.

There is a variety, *brevipila*, with the leaves nearly plane and scarcely piliferous.

7. Tortula ruralis, Sw. (*Great Hairy Screw Moss.*)

Stems elongated; leaves ovato-oblong, keeled, patent, recurved, the nerve ending in a long point; capsule cylindrical, erect, slightly curved; lid subulate, lower half of the peristome tubular as far as the middle.—*Eng. Fl. p.* 45. Barbula ruralis, *Müll. Syn. pt.* 1. *p.* 639.

On walls, thatch roofs, and on the ground, frequent. Fr. April. This is also a very common species, and many an admirer of nature unacquainted with or uninterested in the beautiful structure of its foliage and fruit, has gazed with admiration on its bright green tufts mantling the humble cottage roof, or cheering by their brilliancy the desert wild; for in some soils, such as are of a sandy nature for instance, seem in winter to be entirely clothed with its tufts, and give quite a character to the scenery during the autumn and winter months.

8. TORTULA SUBULATA, Hedw. (*Awl-shaped Screw Moss.*) Stems very short; leaves erecto-patent, oblongo-lanceolate, apiculated, the margin plane; capsule cylindrical, erect, slightly curved; lid subulate; peristome tubular almost to the extremity.—*Eng. Fl. p.* 45. Barbula subulata, *Müll. Syn. pt.* 1. *p.* 624.

Growing on bare ground, on banks, wall-tops, etc. Fr. December. A generally distributed species, and conspi-

cuous from its size. The peristome is a beautiful object, consisting, throughout most of the length, of a bright red lattice-work, having the cilia free only at the end.

9. TORTULA UNGUICULATA, Hook. and Taylor. (*Bird's-claw Screw Moss.*) Stems elongated, branched; leaves oblongo-lanceolate, subcarinated, obtuse, apiculated, their margins slightly recurved; capsule oblongo-ovate; lid long, rostrate.—*Eng. Fl. p.* 45. Barbula unguiculata, *Müll. Syn. pt.* 1. *p.* 612.

Banks, hedge-sides, and sandy fields, everywhere common. Fr. Winter. This is a very common, and, like all such, a very variable species. The "bird claw" appearance of its leaves is striking enough. Scotland.

10. TORTULA CUNEIFOLIA, Turn. (*Wedge-shaped Screw Moss.*) Stems scarcely any; leaves very broad, obovate, slightly concave, pellucid, the nerve running out into rather a strong mucro; capsule oblong; lid with a short beak; cilia of the peristome united at the very base.—*Eng. Fl. p.* 46. Barbula cuneifolia, *Müll. Syn. pt.* 1. *p.* 628.

Banks and sandy fields in Devonshire and Cornwall. Co. Cork, Ireland. This species, though very dissimilar in *structure* from *T. muralis*, has a good deal of its *appearance*, especially that of the var. *brevipila*, with which it has been

confounded. It is common in the west of France and in Italy, but, according to Bruch and Schimper, has not yet been gathered in Germany.

11. TORTULA TORTUOSA, Hedw. (*Frizzled Mountain Screw Moss.*) Stems elongated, branched; leaves patent, linear-subulate, keeled, waved, crisped when dry; capsule cylindrical; lid with a long beak.—*Eng. Fl. p.* 46. Barbula tortuosa, *Müll. Syn. pt.* 1. *p.* 601.

Moist rocks, especially such as are calcareous. Fr. July. Well known by its soft crisp foliage, produced in circular tufts, which clothe the dripping limestone rocks on which it grows. The capsules are not produced in abundance.

12. TORTULA FALLAX, Sw. (*Fallacious Screw Moss.*) Stems elongated, branched; leaves lanceolate, acuminate, keeled, patent or recurved, the margins reflexed; capsule oblong; lid with a long beak.—*Eng. Fl. p.* 46. Barbula fallax, *Müll. Syn. pt.* 1. *p.* 616.

On walls, stony ground, and in fields, everywhere common. Fr. Summer. The specific appellation "fallacious" is an appropriate one, for the appearances it assumes, according to the localities in which it is found, are deceiving and puzzling, even to the practised eye. The following varieties are recorded by Sir W. J. Hooker.

Var. *linioides:* stems two or three inches high; leaves longer and patent.

Var. *brevicaulis:* stems half an inch high; fruit-stalks elongated.

13. TORTULA GRACILIS, Hook. and Grev. (*Slender Screw Moss.*) Stems elongated, somewhat branched; leaves lanceolato-acuminate, erect, rigid when dry, very straight, the margin recurved; capsule oblongo-ovate; lid rostrate, very short.—*Eng. Fl. p.* 47. Barbula gracilis, *Müll. Syn. pt.* 1. *p.* 609.

Scotland, Dickson. Near Cork. Fr. Spring. Nearly allied to *T. fallax,* from which it is distinguished by a more slender habit, and leaves more rigid, erect, and straight. Its colour is a brownish-green.

Tortula stellata, recorded as British in the Eng. Fl. p. 46, on the authority of Dickson, is omitted by us, as it is only found growing in the West Indies, and probably got mixed by accident with that gentleman's British species.

ZYGOTRICHIA, *Brid.*

So named from the teeth of the peristome being united in pairs, a character common to many genera.

Generic Character.—Seta terminal. Peristome of thirty-two teeth, in pairs, spirally twisted above, below united by transverse processes. Calyptra dimidiate.

1. ZYGOTRICHIA CYLINDRICA, Tayl. (*Cylindrical Zygotrichia.*) Stems erect, branched; leaves lanceolato-subulate, entire, their margins recurved; capsule cylindraceous, somewhat narrower at the mouth; lid elongato-conical.—*Fl. Hibernica, pt.* 2. *p.* 26.

On wet sand on the banks of the Dargle river, co. Wicklow, Ireland. This genus, it will be observed, is very closely allied to *Tortula,* and it has been suggested that *T. vinealis* of Bridel, closely allied to *T. fallax,* may be the same plant. Another species has been found in Madeira.

CINCLIDOTUS, *Beauv.* (LATTICE MOSS.)

The anastomosing or latticed structure of the lower part of the peristome is the origin of the name of this genus.

Generic Character.—Seta terminal. Peristome single, of thirty-two filiform, at length twisted teeth, anastomosing at the base. Calyptra mitriform.

1. CINCLIDOTUS FONTINALOIDES. (*Fountain Lattice*

Moss.) Foliage dark green; leaves lanceolate, entire or crenulate *at the tip*, strongly nerved, crisp when dry, the perichætial ones large; capsules on short lateral branches, cylindraceo-oblong, subsessile.—*Eng. Fl. p.* 47. Gümbella fontinaloides, *Müll. Syn. pt.* 2. *p.* 652.

In streams on rock, stones, or wood, preferring such of the former as are calcareous. Fr. Spring. This plant has much the habit of a *Trichostomum*, with which it was united in the 'Flora Britannica.' The bright red teeth of the peristome, which are slender, rigid, and spirally twisted, are beautiful objects.

POLYTRICHUM, *Linn.* (Hair Moss.)

Literally "many-haired" Moss, in allusion to the dense hairy external capsule which is common to the British species, with the exception of the two first, and which we have fully described in the chapter on fructification. Besides this, the foliage of these species has a rigid, aloe-like appearance, giving them a very distinct natural character.

Generic Character.—Seta terminal. Peristome single, of thirty-two or sixty-four short, equidistant, incurved teeth; their summits united to a horizontal membrane, closing the mouth of the capsule. Calyptra dimidiate, small.

** Calyptra destitute of hairs*.*

1. POLYTRICHUM UNDULATUM, Hedw. (*Undulated Hair Moss.*) Leaves membranous, lanceolate, waved, the margins plane, toothed, denticulate, the nerve winged; capsule cylindrical, curved; lid subulate.—*Eng. Fl. p.* 48. Catharinea callibryon, *Müll. Syn. pt.* 1. *p.* 192.

Moist shady banks, in woods and on waste ground, frequent. Fr. Autumn and Winter. A very distinct and beautiful Moss, readily catching the eye of the muscologist during his winter rambles. The peristome is a very beautiful object for the microscope.

2. POLYTRICHUM HERCYNICUM, Hedw. (*Hercynian Hair Moss.*) Leaves lanceolate, rigid, entire, their sides involute, their nerve broad, impressed with furrows; capsule oblong; suberect; lid conical.—*Eng. Fl. p.* 48. Catharinea hercynica, *Müll. Syn. pt.* 1. *p.* 196.

On lofty mountains. Fr. Summer. Abundant on the Breadalbane range in Perthshire. Intermediate, as regards its foliage and calyptra, between the preceding and following species, whence they have been placed in two different sections of the Natural System by Müller.

* This character has suggested the synonyms *Oligotrichum* and *Atrichum*, "few" or "no hairs."

** *Calyptra covered with succulent filaments.*

† *Leaves entire, their margins involute.*

3. POLYTRICHUM PILIFERUM, Schreb. (*Bristle-pointed Hair Moss.*) Leaves lanceolato-subulate, their margins involute, entire, terminating in a pellucid hair-like point; capsule ovate, obtusely quadrangular, furnished with an apophysis; lid conical.—*Eng. Fl. p.* 48; *Müll. Syn. pt.* 1. *p.* 217.

On heaths, and similar waste ground. Fr. Spring. Generally bare of leaves at the base of the stem.

4. POLYTRICHUM JUNIPERINUM, Willd. (*Juniper-leaved Hair Moss.*) Lanceolato-subulate, their margins involute, entire, their points acuminate, coloured, subserrated; capsule ovate, obtusely quadrangular, furnished with an apophysis.—*Eng. Fl. p.* 49; *Müll. Syn. pt.* 1. *p.* 218.

On heathy ground, and wall-tops covered with earth. Fr. Spring. The hair-tipped leaves of this species are the principal mark of distinction from the preceding. Two varieties are recorded both by British and Continental authors, viz. *strictum* and *alpestre*.

5. POLYTRICHUM SEPTENTRIONALE, Sw. (*Northern Hair Moss.*) Leaves linear-subulate, obtuse, their margins, especially towards the top, involute, subserrulate; capsule ovate,

subangulate; apophysis obsolete; lid conical, acuminate.—*Eng. Fl. p.* 49; *Müll. Syn. pt.* 1. *p.* 223.

Summits of the Cairngorum Mountains in Scotland. Fr. August (rare). This Moss is peculiarly a denizen of the most elevated alpine districts and Arctic regions, being only found close on the limits of perpetual snow. It is rarely found in fruit, seeming to be in that condition chiefly in wet seasons. Mr. Gardiner of Dundee, in his 'Botanical Rambles in Braemar,' gives an account of his visit to Ben Mac Dhui, one of the loftiest Scottish mountains, where at midsummer he found this interesting Moss at the "margin of a considerable field of snow, and bearing plenty of capsules." No wonder that the "drizzling rain" and benumbing cold were "for a few minutes" forgotten. Its leaves are much like those of *P. Hercynicum*, with the stems more thickened and a smaller capsule. *P. sexangulare* of some authors, seems the same plant with the angles more defined. It is also found on Melville Island in the southern hemisphere.

†† *Leaves serrated, their margins plane.*

6. POLYTRICHUM COMMUNE, L. (*Common Hair Moss.*) Stems elongated; leaves patent, linear-subulate, their margins plane, serrated as well as the points of the keels;

capsule oblongo-quadrangular, with an evident apophysis.—*Eng. Fl. p.* 49; *Müll. Syn. pt.* 1. *p.* 220.

On heaths and in woods, especially on wet sandy soils. Fr. Summer. One of the giants of the tribe, its size varying from a span to a foot in length. It is generally distributed through all the temperate regions of the globe, and varies according to the climate it lives in. The principal variety found in Britain is that named *attenuatum* in the English Fora.

We have already, in the introductory chapter, referred to the economical use of this and other Mosses. Its value to the Laplanders "for bed and bedding" is, according to Linnæus, very great, though his account of its properties seems somewhat exaggerated. It ought to increase our interest in it however, to know that the great Naturalist, in his wanderings in pursuit of botanical rarities in these inhospitable climes, often made his couch and pillow of the matted stems of this *Polytrichum*. Dillenius tells of an oil expressed from it, which the ladies of his day used for their hair; and the amiable Mr. White, in his History of Selborne, speaks of it as having soft and pliant stems, "very proper for the dusting of beds, curtains, carpets, etc." We believe the purpose to which the latter refers to its being put, a very

Neckera crispa.

Œdipodium Griffithianum

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useful one; indeed it is adopted in many parts of the country; but we have little faith in it otherwise as a cosmetic, and feel it would have more of such a property if used with its neighbour broom by our female peasantry for removing from their cottage-doors the unsightly and pestilential pools still too frequent in rural districts. In the north of England its popular name is Moor Silk.

7. POLYTRICHUM ALPINUM, Linn. (*Alpine Hair Moss.*) Stems elongated, branched in a fasciculated manner; leaves patent, subulato-lanceolate, their margins plane, serrated as well as the points of the keels; capsule oblique, subovate, with a distinct apophysis.—*Eng. Fl. p.* 50; *Müll. Syn. pt.* 1. *p.* 210.

In alpine districts, on the ground, frequent; rarely, as in a station in Wales, in the low country. Fr. July. The structure of the capsule is a sufficient mark of distinction for this species.

8. POLYTRICHUM URNIGERUM, *Linn.* (*Urn-bearing Hair Moss.*) Stems elongated, branched; leaves erecto-patent, lanceolate, acute, their margins plane, serrated; capsule erect, cylindrical, destitute of an apophysis.—*Eng. Fl. p.* 50; *Müll. Syn. pt.* 1. *p.* 208.

Moist sandy places, and banks of streams, chiefly in

mountainous districts. Fr. November. Distinguished by the glaucous colour of its leaves, which assume a reddish tinge in an aged state.

9. POLYTRICHUM ALOIDES, Hedw. (*Dwarf Long-headed Hair Moss.*) Stems usually short; leaves linear-lanceolate, obtuse, their margins plane, serrated, principally at the extremity and at the summit of the keels; capsule nearly erect, cylindrical; apophysis none; seta very short; stems branched with innovations.—*Eng. Fl. p.* 50; *Müll. Syn. pt.* 1. *p.* 202.

Moist sandy banks, and gravelly soil in woods, common. Fr. Winter. There is a variety (*Dicksoni*) in which the seta is very short and the stem is branched with innovations.

10. POLYTRICHUM NANUM, Hedw. (*Dwarf Round-headed Hair Moss.*) Stems short; leaves linear-lanceolate, obtuse, their margins and the summit of the keel serrated, principally at the extremity; capsule nearly erect, subglobose.—*Eng. Fl. p.* 51; *Müll. Syn. pt.* 1. *p.* 204.

In similar situations as the preceding, with which it is frequently associated. Fr. Winter. The form of the capsule is almost the only mark of distinction from the former. Both are neat little Mosses, and form a distinct group of the genus. Their tufts are frequently surrounded by a deep

green velvety substance, which is found to be a young confervoid state of the plant.

Division 2. *DIPLOPERISTOMI.*

ENTOSTHODON, *Schwægr.* (ENTOSTHODON.)

This name is derived from two Greek words signifying "within the tooth," from the manner in which the teeth of the peristome are inserted.

Generic Character.—Seta terminal. Peristome double? the outer of sixteen remote teeth, arising from within the mouth of the capsule, horizontal; the inner obsolete or wanting. Capsule pyriform, with an apophysis.

1. ENTOSTHODON TEMPLETONI. (*Templeton's Entosthodon.*) Leaves rosulate, spreading, obovate, acuminate, the nerve disappearing before the apex, crenate at the margin; lid plano-convex; calyptra rounded at the base.—*Eng. Fl. p.* 51; *Müll. Syn. pt.* 1. *p.* 124.

Moist ground on tenacious soil; common in Ireland; found also in Wales and in the west of Scotland. Fr. Summer. This Moss has been classed with *Funaria* and *Weissia*, and with the former genus it has affinity in habit,

in some respects also with *Splachnum*. The traces of the double peristome are rarely and with difficulty traced, so that it is somewhat out of place in this division. It has a wide range as to its geographical distribution, being found throughout most of Europe, Tangiers, Egypt, Teneriffe, and, by Mr. Schimper, flourishing luxuriantly near fountains on Sinai's hallowed mount.

FUNARIA, *Schreb.* (CORD MOSS.)

The setæ or fruit-stalks of this genus have remarkable hygrometric properties, twisting like a piece of cord in dry weather, whence the name, from *funis*, a rope or cord.

Generic Character.—Seta terminal. Peristome double, oblique; the outer of sixteen compact teeth; the inner of the same number of cilia opposite to the teeth of the other. Capsule pyriform, its mouth oblique. Calyptra inflated below.

1. FUNARIA HYGROMETRICA, Hedw. (*Hygrometric Cord Moss.*) Leaves very concave, ovate, apiculated, entire; nerve excurrent; seta curved, flexuose.—*Eng. Fl. p.* 52; *Müll. Syn. pt.* 1. *p.* 107.

On the ground, especially where wood has been burnt, walls and rocks. Fr. Spring. A common, distinct, and

elegant Moss, marked by its pale green patches, and orange or reddish capsules when mature, which contrast finely with the scorched ground on which it is usually found growing very luxuriantly. From this circumstance it is called in France *la Charbonnière*. It is generally distributed over the globe.

2. FUNARIA MÜHLENBERGII, Turn. (*Dr. Mühlenberg's Cord Moss.*) Stems short; leaves concave, ovate, suddenly acuminated, serrated, the nerve disappearing below the point; seta straight.—*Engl. Fl. p.* 52; *Müll. Syn. pt.* 1. *p.* 109.

Among rocks in a calcareous soil; frequent in the south of England and Ireland. Fr. Spring.

3. FUNARIA HIBERNICA, Hook. (*Irish Cord Moss.*) Stems elongated; leaves plane, ovato-lanceolate, gradually acuminated, serrated, the nerve disappearing below the point; seta straight.—*Engl. Fl. p.* 52; *Müll. Syn. pt.* 1. *p.* 110.

In shady places on sandy soil. First discovered by Drummond on the thatched roof of a cottage at Blarney, near Cork. Fr. Spring. Closely allied to the preceding, and both are regarded as mere varieties of *F. hygrometrica* by the author of "*Musci*," in 'Flora Hibernica,' where an

experiment of sowing spores is recorded in corroboration of this opinion.

ZYGODON, *Hook.* (YOKE MOSS.)

The name of this genus signifies "yoke tooth," from the teeth of the peristome being united in pairs. Though we have but one species in this country, there are a good many in warmer latitudes, and in the southern hemisphere.

Generic Character.—Seta terminal. Peristome double; the outer of sixteen teeth, approaching in pairs; the inner of eight or sixteen cilia, lying horizontally. Calyptra dimidiate, smooth.

1. ZYGODON CONOIDEUS, Hook. and Taylor. (*Lesser Yoke Moss*) Leaves acute; cilia eight.—*Eng. Fl. p.* 52; *Müll. Syn. pt.* 1. *p.* 667.

Trunks of trees, chiefly in the west of Britain and Ireland. In the latter, Ireland, it is said to grow frequently on the Hazel and Ash. In the old romantic woods round Inverary Castle, Argyleshire, we have picked it in fine condition on the latter tree, associated with a very nearly allied plant, the *Gymnostomum* (*Zygodon*) *viridissimum*. Fr. January. The leaves have a beautifully dotted appearance under the microscope.

ORTHOTRICHUM, *Hedw.* (Bristle Moss.)

"A peculiar and yet natural genus," the species being very similar in the appearance of their leaves and branches. From the peristome varying much in its nature, it is necessary, in examining the plants, to have the capsule in good condition. Weber and Mohr, in their 'Botanical Handbook,' say "that there is scarcely any genus more beautiful, and not many more difficult." The name of the genus is derived from the circumstance of the calyptra being in most of the species well covered with "straight hairs," like some species of *Polytrichum*.

Generic Character.—Seta terminal. Peristome mostly double; the outer of sixteen teeth, approaching in pairs; the inner of as many cilia, lying horizontally (sometimes wanting). Calyptra mitriform, furrowed, more or less hairy.

* *Peristome single.*

† *Capsule immersed.*

1. Orthotrichum cupulatum, Hoffm. (*Single-fringed Sessile-fruited Bristle Moss.*) Leaves ovato-lanceolate, erecto-patent, when dry erect, straight, rigid; capsule nearly sessile, furrowed for its whole length, quite glabrous.—*Eng. Fl. p.* 53; *Müll. Syn. pt.* 1. *p.* 700.

On rocks, damp walls, and trunks of trees. Fr. Spring. This species has a rigid habit, and dark colour, with obtuse leaves strongly nerved.

†† *Capsule exserted.*

2. ORTHOTRICHUM ANOMALUM, Hedw. (*Anomalous Bristle Moss.*) Stems erect; leaves ovato-lanceolate, erecto-patent, straight when dry; teeth eight, geminate; calyptra slightly hairy.—*Eng. Fl. p.* 53; *Müll. Syn. pt.* 1. *p.* 694.

On rocks and walls. Fr. Spring. This is a handsomer species than the preceding, which it somewhat resembles in habit, and with which it has been confounded by some authors. It is usually found in fine condition on the trap-rock of Arthur's Seat, especially such as project a little way beyond their grassy covering.

3. ORTHOTRICHUM DRUMMONDII, Hook. (*Mr. Drummond's Bristle Moss.*) Stems creeping; leaves narrow, lanceolate, crisped when dry; capsule elongato-clavate, deeply furrowed; calyptra very hairy.—*Eng. Fl. p.* 54; *Müll. Syn. pt.* 1. *p.* 712.

Stems of Birches and other trees, in the west Highlands of Scotland; near Belfast, and in the woods of Killarney, Ireland. It is probably not uncommon in mountain districts of the north of England, as Mr. Spruce, in his account of

the Muscology of Teesdale, mentions that it "is more abundant in upper Teesdale than any other of the genus, and may be met everywhere on shrubs and young trees." Fr. August. This is a beautiful species, somewhat resembling the common *O. crispum*, also a woodland tenant, from which the specific character given above will distinguish it. It is named after the illustrious Drummond, who first discovered it. It is found also in Norway, but does not seem abundant in any district of Europe.

** *Peristome double.*

† *Capsule immersed.*

4. ORTHOTRICHUM AFFINE, Schrad. (*Pale Straight-leaved Bristle Moss.*) Stems erect; leaves erecto-patent, flaccid, broadly lanceolate; capsule deeply furrowed; teeth of the peristome eight, geminate; cilia filiform; calyptra slightly hairy.—*Engl. Fl. p.* 54; *Müll. Syn. pt.* 1. *p.* 705.

On trunks of trees, and old pales; very common. Fr. August. This is the species of *Orthotrichum* most likely to meet the eye of the young muscologist, who will be able to distinguish it from the above description, though it varies in size and in the hairiness of the calyptra.

5. ORTHOTRICHUM STRAMINEUM, Hornsch. (*Straw-like Bristle Moss.*) Stem branched; leaves spreading when dry,

loosely imbricated, lanceolate, with reflexed margin, carinate; capsule oblongo-pyriform, broadly striate, brownish-yellow; calyptra campanulate, slightly pilose; teeth of the peristome eight, bigeminate.—*Hornsch. ined.; Brid. Bryol. Univ. v.* 1. *p.* 789; *Müll. Syn. pt.* 1. *p.* 697.

On an Ash-tree near the bridge across the Lune, between Mickleton and Lonton, in Teesdale; very scarce. Fr. Summer and Autumn. This rare Moss was found by Mr. Spruce in the above locality, and is described more fully by him in the second volume, part 1, of the Transactions of the Botanical Society of Edinburgh. We have placed it here from its affinity with *O. affine*, with which it is frequently associated. Mr. Spruce also records the discovery of *O. pallens*, Bruch, near York, which seems closely allied to this species.

6. Orthotrichum rupincola, Funck. (*Rock Bristle Moss.*) Stems erect or procumbent; leaves suberect, straight, rigid, broadly lanceolate; capsule furrowed above; teeth sixteen, patent; calyptra very hairy.—*Eng. Fl. p.* 54. Orthotrichum rupestre, *Müll. Syn. pt.* 1. *p.* 707.

On rocks and stones on the mountains. Fr. June. This species is very rigid in habit, with some of the general character of *O. affine*, but affecting quite a different habitat.

7. Orthotrichum diaphanum, Schrad. (*Diaphanous-*

pointed Bristle Moss.) Stems erect, very short; leaves lanceolato-acuminate, diaphanous at the points; calyptra slightly hairy.—*Eng. Fl. p.* 54; *Müll. Syn. pt.* 1. *p.* 694.

Trunks of trees and similar situations, especially near the sea. In the neighbourhood of Edinburgh, pretty abundant. Fr. Feb. It seems to prefer the chinks of old trees, close to the ground, as a place of growth, and is easily distinguished by the diaphanous points of the leaves.

8. ORTHOTRICHUM RIVULARE, Sm. (*River Bristle Moss.*) Stems procumbent; leaves broadly lanceolate, obtuse; cilia setaceous; calyptra glabrous.—*Eng. Fl. p.* 55; *Müll. Syn. pt.* 1. *p.* 699.

On rocks and stones in streams. Fr. August. This species will be readily recognized by the length of its stems, attaining a height of two or three inches, which, with their dark lurid-green colour, remind one of the Lattice Moss (p. 163). It is not common on the Continent.

9. ORTHOTRICHUM SPRUCEI, Montagne. (*Spruce's Bristle Moss.*) Stems slightly branched; leaves lanceolate, ligulate, rounded and shortly apiculate; theca immersed, subglobose or pyriform; peristome with eight transparent cilia. —*Müll. Syn. pt.* 1. *p.* 699.

Allied to the preceding and to var. *pumilum* of *O. affine*,

and made a separate species by Montagne, on account of the larger and somewhat differently formed leaves and structure of the cells, as well as the character of its fruit; originally described in 'London Journal of Botany' for 1845, p. 186. Found on the trunks of Willows, by the Ouse, near York, by Mr. Spruce, and subsequently in similar habitats by other botanists.

10. ORTHOTRICHUM STRIATUM, Hedw. (*Common Bristle Moss.*) Stems erect; leaves lanceolate, patent, straight when dry; capsule ovate, smooth; cilia torulose; calyptra slightly hairy.—*Eng. Fl. p.* 55; *Müll. Syn. pt.* 1. *p.* 708.

Stems of trees. Fr. June. This species has a peculiar inner peristome composed of moniliform joints, which are broad, pale-coloured, and frequently jointed, and which arise from the inner membrane of the capsule, as in *Hypnum*.

11. ORTHOTRICHUM LYELLII, Hook. and Taylor. (*Mr. Lyell's Bristle Moss.*) Stems erect, elongated; leaves linear-lanceolate, subundulate, carinated, very acute, crisped when dry; capsule oblong, furrowed; cilia filiform; calyptra very hairy.—*Eng. Fl. p.* 55; *Müll. Syn. pt.* 1. *p.* 709.

Discovered on trees in the New Forest, Hants, by Mr. Lyell. Found since in various parts of England, and frequent in the subalpine districts of Scotland. Its long nar-

row crisped leaves, and sessile fruit, distinguish it from the preceding, which it rivals in length of stem. On the leaves there often grows a minute *Conferva*, the *C. orthotrichi*, which gives the whole plant a brownish appearance. It rarely fruits.

†† *Capsule exserted.*

12. ORTHOTRICHUM SPECIOSUM, Nees. (*Showy Bristle Moss.*) Stems erect; leaves ovato-lanceolate, acuminate, patent, scarcely recurved at the margins and point; capsule slightly furrowed; teeth of the peristome eight, at length separating into sixteen, and reflexed; calyptra hairy.—*Eng. Fl. p.* 55; *Müll. Syn. pt.* 1. *p.* 705.

Trunks of trees, in Scotland. First discovered near Montrose by Mr. Reid. Fr. Summer. The colour of the foliage is of that reddish-brown shade which distinguish tropical species. According to Bruch and Schimper it is, with *O. affine*, one of the most common species in Europe.

13. ORTHOTRICHUM HUTCHINSIÆ, Sm. (*Miss Hutchins's Bristle Moss.*) Stems erect; leaves lanceolate, erect, rigid; capsule clavate, furrowed; calyptra very hairy.—*Eng. Fl. p.* 56; *Müll. Syn. pt.* 1. *p.* 692.

On rocks in the alpine districts of Britain and Ireland; first discovered in the latter by the lady whose name it bears.

Fr. May. The foliage is very dark below, but at the apex the leaves have a brownish-yellow hue. Its capsule resembles that of *O. crispum*.

14. ORTHOTRICHUM LUDWIGII, Brid. (*Ludwigian Bristle Moss.*) Stems creeping; leaves erecto-patent, narrowly lanceolate, crisped when dry; capsule pyriform, smooth, furrowed only at the extremity; mouth extremely contracted; calyptra remarkably hairy.—*Eng. Fl. p.* 56; *Müll. Syn. pt.* 1. *p.* 714.

In subalpine districts, growing chiefly on young Oaks and Birches; pretty abundant in various Scottish glens. Fr. August. Readily distinguished by the very contracted mouth of its capsule, whence a synonym *O. clausum*, or "shut up." The cilia are so very delicate and fugacious that they are regarded by some authors as only the vestiges of a membrane that covers the teeth before the lid drops off.

15. ORTHOTRICHUM CRISPUM, Hedw. (*Curled Bristle Moss.*) Stems erect; leaves lanceolato-subulate, much crisped when dry; capsule oblongo-clavate, furrowed; teeth of the peristome eight, geminate, patent, reflexed; calyptra very hairy.—*Eng. Fl. p.* 56; *Müll. Syn. pt.* 1. *p.* 712.

On the stems of trees in woods, abundant; rare on stones. Fr. August. A well-marked and common species, forming

a great ornament to our woodland scenery. Its leaves are frequently clothed with the *Conferva* we have mentioned as infesting the *O. Lyellii*. Barren plants have a tendency to creep.

> "Here amid
> The silent majesty of these deep woods,
> Bright mosses crept over the spotted trunks."

16. ORTHOTRICHUM PULCHELLUM, Sm. (*Elegant Bristle Moss.*) Stems creeping, short; leaves narrow-lanceolate, crisped when dry; teeth of the peristome sixteen, approaching in pairs, patent (red); calyptra almost glabrous, plaited at the base.—*Eng. Fl. p.* 56; *Müll. Syn. pt.* 1. *p.* 711.

On trunks of trees, in various districts of the country, seeming to prefer those that are subalpine. Near Manchester, Mr. Hobson. Ballinascorney Glen, near Dublin, Taylor. We have found it near Cushendall, co. Antrim. Fr. May. This Moss well deserves the specific name given to it by Smith, as it is an exceedingly neat species. Distinguished from others by having sixteen ciliary processes connected with the peristome. The calyptra is plicate and almost smooth. According to Mr. Wilson, the capsule is "generally tuberculated."

BRYUM, *Linn.* (THREAD MOSS.)

This is a name of Greek derivation, being applied by Dioscorides and Pliny to some family of plants, and adopted by Dillenius. *Bryum* is a large and important genus, whether with reference to the Flora of Britain or foreign lands. It has been subdivided in various works on Muscology into several genera, such as *Mecsia*, *Mnium*, *Pohlia*, *Webera*, etc., according to the structure of the peristome, but these have more recently been regarded as affording only characters for subdivisions of the genus. The subgenera indicated by these subdivisions we note in the different sections, following the arrangement adopted in the 'English Flora,' vol. v.

> "Every knoll and brake, streamlet and rock,
> How richly peopled with creation bright!"

Generic Character.—Seta terminal. Peristome double, the outer of sixteen teeth; the inner of a membrane cut into sixteen equal segments, with filiform processes frequently placed between them. Calyptra dimidiate.

A. *Capsules sulcated.* (Mnium, *Brid.*)

1. BRYUM ANDROGYNUM, Hedw. (*Narrow-leaved Thread Moss.*) Stems nearly simple, lanceolate, serrated, their mar-

Phascum bryoides

Orthotrichum affine

Phascum cuspidatum

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gins recurved; capsule nearly erect, cylindrical, sulcated; lid conical.—*Eng. Fl. p.* 57. Mnium androgynum, *Müll. Syn. pt.* 1. *p.* 770.

On banks and rocks, and under the shade of old trees; rare in fruit, and producing it more freely when growing on shady ground. Fr. June. This rare Moss very much resembles a miniature of the succeeding, a very common species. Though the capsules are so rare, its stems are abundantly tipped with short naked stems, supporting each a little greenish ball, such as we described existing on the stems of *Tetraphis*. These are *gemmæ*, or buds, the *male flowers* of Hedwig, and now known to Muscologists as *pseudopodia*. Bruch and Schimper say this species always grows on quartz, never on calcareous or marly soil.

2. BRYUM PALUSTRE, Sw. (*Marsh Thread Moss.*) Stems much branched; leaves lanceolate, obtuse, entire, their margins revolute; capsule ovate, oblique, sulcated; lid conical.—*Eng. Fl. p.* 57. Mnium palustre, *Müll. Syn. pt.* 1. *p.* 169.

Bogs, common; but it is only now and then that the capsules are abundant. Fr. June. The "male flowers" in this species are discoid, on elongated stalks; *pseudopodia* of similar character to the preceding are also found, but not

so plentiful. Several varieties are enumerated by Continental authors.

B. *Capsules smooth.*

a. *Teeth of the outer peristome shorter than the inner.*

(Meesia, *Hedw.*)

3. BRYUM TRICHODES, Linn. (*Capillary Thread Moss.*) Stems somewhat branched; leaves linear, obtuse, entire, reticulated; capsule narrow-pyriform, curved, subcernuous; seta very strong.—*Eng. Fl. p.* 57. Meesia uliginosa, *Müll. Syn. pt.* 1. *p.* 465.

Wet places on the Scottish mountains. On basaltic rocks, Winch Bridge, Teesdale. Fr. August. A neat species, of a deep yellow-green colour.

4. BRYUM TRIQUETRUM, Turn. (*Long-stalked Thread Moss.*) Stems elongated, branched; leaves lanceolate, carinate, acute, serrated, reticulated; capsule pyriform, erecto-cernuous; seta exceedingly long.—*Eng. Fl. p.* 58. Meesia longiseta, *Müll. Syn. pt.* 1. *p.* 465.

Found by Dr. Scott "on the borders of a lake in the north of Ireland."

5. BRYUM DEALBATUM, Dicks. (*Pale-leaved Thread Moss.*) Stems short; leaves lanceolate, acute, plane, reticulated, serrated at the points; capsule pyriform, nearly

erect.—*Eng. Fl. p.* 58. Amblyodon dealbatus, *Müll. Syn. pt.* 1. *p.* 127.

On boggy and damp places in the plains and subalpine districts. Fr. Summer. This is not a common Moss in Britain, though it is found throughout the most of Europe. The structure of the foliage shows an affinity with the family of *Funaria*, while that of the capsule and peristome ally it with different sections of the genus to which it belongs.

b. *Teeth of the outer peristome as long as the inner.*

* *Leaves without a thickened margin.*

† *Nerve of the leaf not reaching to the point.*

6. BRYUM SQUARROSUM, Hedw. (*Squarrose Thread Moss.*) Stems loosely branched, downy, with roots; leaves ovate, acute, serrulate, remarkably reflexed; nerve disappearing below the point; capsule oblong, nearly erect, unequal, substrumose at the base. Paludella squarrosa, *Müll. Syn. pt.* 1. *p.* 468.

Knutsford Moor, Cheshire, Mr. Wilson, April 1832. Fr. (unknown in Britain) Summer. Müller well denotes this as "a remarkable genus (*Paludella* of Ehrhart), uniting the *Meesiaceæ* with the *Bartramiaceæ*." It is found in the deep marshes of the north of Germany, and other cold districts

of Europe. Berg also gathered specimens at the Cape of Good Hope.

7. BRYUM JULACEUM, Schrad. (*Slender-branched Thread Moss.*) Stems branched; leaves closely imbricated, broadly ovate, concave, entire, obtuse; nerve reaching nearly to the point; capsule ovato-cylindraceous, pendulous.—*Eng. Fl. p.* 58. B. argenteum, *var.* majus, *Müll. Syn. pt.* 1. *p.* 314.

On sandy and micaceous soils, near streams and waterfalls, in alpine districts. Fr. November. This is a beautiful species, with silvery green foliage, resembling much in appearance the common *B. argenteum*, of which, by many Continental Botanists, since the time of Linnæus, it has been regarded as a variety.

Mr. Spruce has found at "Caldron Spout," in Teesdale, and on the Pyrenees, a Moss nearly allied to this, which he has described as a distinct species—*B. concinnatum*—in the 'Annals of Natural History' for 1849; its fruit however is unknown: see also *Müll. Syn. pt.* 2. *p.* 575.

8. BRYUM CRUDUM, Huds. (*Transparent Green Thread Moss.*) Stems simple; leaves rigid, lanceolate, erect, the upper ones narrowest and longest, all of them plane, serrulate, the nerve disappearing below the summit; capsule oblongo-subpyriform, cernuous.—*Eng. Fl. p.* 58.

Crevices of rocks and on the ground, in mountainous countries. Fr. Summer. A neat and distinct species, with curiously curved capsules and shining green foliage.

9. BRYUM CARNEUM, Linn. (*Soft-leaved Thread Moss.*) Stems simple; leaves lanceolate, reticulated, slightly serrulate at the point; nerve disappearing below the summit; capsule obovate, pendulous.

On sandy and clayey banks that are somewhat moist, generally associated with other Mosses. Fr. Spring. This is a minute species; the stems are sometimes innovated, and covered with earth, and the foliage, except the tips of the leaves, which are dingy green; fruit-stalk and capsule are of a reddish hue. The reticulations of the cellular tissue in the leaf are so large, that they may be distinguished by a pocket-lens of moderate power.

10. BRYUM ALBICANS, Wahl. (*Pale-leaved Thread Moss.*) Stems branched; leaves ovate, acute, the upper ones lanceolate, subdenticulate, reticulated, the margins plane; nerve disappearing below the summit; capsule pyriform, pendulous.—*Eng. Fl. p.* 59; *Müll. Syn. pt.* 1. *p.* 295. B. Wahlenbergi, *Schwæg.*

Moist sandy ground, both in the low country and mountain districts. Found in Angusshire by Mr. Lyell,

and near Aber, North Wales, by Mr. Wilson. Fr. Spring. This species has much of the appearance of *B. turbinatum*, for which it may frequently have been taken. The capsules especially resemble that species, while the leaves correspond much with those of *B. carneum*, though somewhat broader.

11. Bryum Ludwigii, Spreng. (*Ludwig's Thread Moss.*) Stems ascending or erect, branched with annotinous shoots; leaves ovate, rather obtuse, the upper ones lanceolate, rather distinctly reticulated, subserrated, concave, the margins plane; nerve disappearing below the summit; capsule oblong, pendulous.—*Eng. Fl. p.* 59; *Müll. Syn. pt.* 1. *p.* 332.

On the Clova Mountains, in shady spots where water has stood; gathered there by a well-known trio of British Muscologists, Drs. Hooker, Arnott, and Greville. Fr. September. It has several sets of shoots rising one above another, according to the years in which they have been produced, the last series being alone green, the others darkened by the snow-water, with which it is in most cases in close proximity.

12. Bryum argenteum, Linn. (*Silvery Thread Moss.*) Stems branched; leaves closely imbricated, broadly ovate, suddenly and sharply acuminated, subserrulate, very concave, the nerve disappearing below the point; capsule ovato-

pyriform, pendulous.—*Eng. Fl. p.* 60; *Müll. Syn. pt.* 1. *p.* 314.

On wall-tops, thatched roofs, and by waysides everywhere. Fr. Spring. This pretty species can hardly have escaped the notice of the most superficial observer of nature's works, its deep silvery-green tufts are so different from any other Moss around. Its compact stems, formed by the closely adpressed leaves, give it so much the appearance of the drooping clusters of the flowers of the Hazel and Poplar, that Dillenius called it the "Catkin-stemmed Silver Moss." It is found in all parts of the world, and in warm climates the leaves are tipped with hairs of such length, as to give them the appearance of tufts of wool, whence the name of the var. *lanatum*, or "woolly."

13. BRYUM ZIERII, Dicks. (*Zierian Thread Moss.*) Stems branched; leaves closely imbricated, more or less broadly ovate, acuminate, very concave, reticulated, entire; nerve running nearly to the point; capsule clavate, cernuous.—*Eng. Fl. p.* 60; *Müll. Syn. pt.* 1. *p.* 288.

In damp crevices of rocks, on the mountains throughout the United Kingdom. Fr. Summer. The leaves of this species are closely adpressed to the stems, so as to give it somewhat the appearance of *B. argenteum;* but the reddish

appearance of the lower foliage and long club-shaped capsule sufficiently distinguish it.

†† *Nerve of the leaf reaching to the point or beyond it.*

14. BRYUM PYRIFORME, Sw. (*Pear-fruited Thread Moss.*) Stems slightly branched; leaves subulato-setaceous, flexuose, serrated, their nerve very broad; capsule pyriform, pendulous.—*Eng. Fl. p.* 60; *Müll. Syn. pt.* 1. *p.* 330.

On moist sandy ground in shaded places, and on sandstone rocks. Often growing on the surface of the earth in garden-pots in greenhouses. Fr. June. The leaf of this species consists almost entirely of the broad nerve, by which it may be well known. Its setæ and capsules are of a fine bright orange tint when they attain maturity.

15. BRYUM CAPILLARE, Linn. (*Greater Matted Thread Moss.*) Stems short; leaves obovate, twisted when dry, entire, their nerve produced into a hair-like point, their margins slightly thickened; capsule oblong, pendulous.—*Eng. Fl. p.* 60; *Müll. Syn. pt.* 1. *p.* 281.

Rocks, walls, and on the ground; common. Fr. May. One of the first Mosses the young beginner is likely to have his attention drawn to, whether he goes in search of them in Autumn, when its transparent green capsules are yet in an immature state, or in Spring, when these are well

ripened, and throwing off their lid. The form of the leaf, its twisted appearance in a dry state, and the hair-like point by which it is terminated, are the chief marks to distinguish it from the next species, which it much resembles in general appearance.

16. BRYUM CÆSPITITIUM, Linn. (*Lesser Matted Thread Moss.*) Stems short; leaves ovate, acuminated, entire, or very obscurely serrated at the points, their margins slightly recurved, the nerve reaching to or beyond the point; capsule ovali-pyriform, pendulous.—*Eng. Fl. p.* 61; *Müll. Syn. pt.* 1. *p.* 284.

Wall-tops, roofs of houses, etc., very common. Fr. Spring. This species is found very much in the same localities as the preceding, and the remarks we have made on that species are equally applicable to the present. They may both be regarded as cosmopolitan, and, like most of that class, vary much in appearance. These variations we have thought it unadvisable to describe at great length, for two reasons: first, they are so numerous, that the space we wish to devote to more familiar objects would be for a popular work injudiciously abridged; and second, Bryologists are very much at variance as to the claims of the respective forms of these variations to rank as species. We

therefore content ourselves with enumerating the most prominent of these. For further information we refer our readers to the works of Hooker, Müller, Bridel, Bruch and Schimper, and other writers.

B. bimum.	*B. Wahlenbergi.*
B. erythrocarpum.	*B. stellare.*
B. obconicum.	*B. annotinum*, etc.

17. Bryum turbinatum, Sw. (*Turbinate Thread Moss.*) Stems short, branched with innovations; leaves ovate, acuminate, nearly entire, their margins slightly recurved, their nerve running beyond the points; capsule elongato-pyriform, pendulous.—*Eng. Fl. p.* 61; *Müll. Syn. pt.* 1. *p.* 259.

Moist places in sandy soil, gravel-pits, etc., especially in mountainous districts. Fr. July. This is also a very variable species, bordering closely on some forms of allied species. Its pear-shaped capsule is the most defined character.

18. Bryum nutans, Schreb. (*Silky Pendulous Thread Moss.*) Stems short; leaves erect, lanceolate, acuminate, serrated above; nerve reaching to the point; capsule oblongo-pyriform, pendulous.—*Eng. Fl. p.* 61; *Müll. Syn. pt.* 1. *p.* 335.

On the ground in peaty soil, sometimes on rocks and

wall-tops. Fr. May. A widely distributed species, varying considerably in form. It is a pretty species, the pale green glossy foliage contrasting well with the dark soil on which it is usually found. The setæ are orange-red when mature, and the capsule becomes more pyriform as it ripens. We should also mention that this is a variable species, and that, when its capsule is mature, it is more especially apt to be taken for others.

19. BRYUM ELONGATUM, Dicks. (*Long-necked Thread Moss.*) Stems short; leaves erect, elongato-lanceolate, acuminate, serrated; nerve reaching to the point; capsule elongato-clavate, inclined (rarely drooping).—*Eng. Fl. p.* 62; *Müll. Syn. pt.* 1. *p.* 336.

On moist shady ground, and in the clefts of rocks on the mountains. Fr. July. In the length of the capsule and the rigid glossy foliage, this species resembles *B. crudum*. The peristome shows that it belongs to the section *Pohlia*, in which the intermediate cilia of the peristome are wanting.

20. BRYUM GRACILE, Wils. (*Slender Thread Moss.*) Stems dwarf, growing in small tufts; leaves lanceolate, subulate, flexuous and patent, entire, slightly carinate; capsule pale red, suberect or oblique, with a long neck; lid

rostellate; teeth of the peristome somewhat irregular, the internal ones half the length of the external. Pohlia gracilis, *Wils. in Gard. Muscol. Brit. tab.* 34. *app.* Orthodontium gracile, *Müll. Syn. pt.* 1. *p.* 238.

On sandstone rocks near Helsby, Cheshire, Mr. Wilson. Fr. Spring. This interesting Moss was detected by Mr. Wilson in the above locality in 1833, but we are not aware that it has been found elsewhere in the country, though M. Schimper has gathered it on the Abyssinian Alps.

21. Bryum alpinum, Linn. (*Red Alpine Thread Moss.*) Stems elongated, rigid, branched; leaves closely imbricated, erect, lanceolate, somewhat obtuse, subserrulate at the apex, the margins revolute; nerve reaching to the points; capsule oblong-ovate, pendulous.—*Eng. Fl. p.* 62; *Müll. Syn. pt.* 1. *p.* 285.

In subalpine districts, on moist rocks and stones, preferring such as are exposed. Fr. June. The fine reddish-purple colour of this species sufficiently distinguishes it from others. Its foliage is closely imbricated or lapping over, and in a dry state is very glossy.

22. Bryum ventricosum, Dicks. (*Swelling Bog Thread Moss.*) Stems elongated, branched with innovations; leaves oblong, acuminated, scarcely serrulate, the margins recurved;

nerve reaching beyond the point; capsule oblongo-ovate, pendulous.—*Eng. Fl. p.* 62; *Müll. Syn. pt.* 1. *p.* 258.

In bogs and on wet rocks, in subalpine districts. Fr. Summer. This is a large and elegant species, having many innovations on the stem, the leaves and branches composing which are frequently of a beautiful reddish-brown colour.

23. BRYUM DEMISSUM, Hook. (*Club-fruited Thread Moss.*) Stems very short, branched; leaves ovate, cuspidato-acuminate, reticulated, their nerve excurrent; seta arched; capsule curved and pyriform, the mouth oblique.—*Eng. Fl. p.* 62; *Müll. Syn. pt.* 1. *p.* 289.

On rocks upon Craigalleach (Perthshire) and other of the Breadalbane mountains, always in elevated and exposed situations, where its "gem-crowned stalks" seem "too tender to bear one flake of snow." Fr. August. Bruch and Schimper justly remark that "this rare and elegant Moss presents some analogy in the form of its capsule with *B. Zierii.*" Its tufts however are more compact, and the branches, from the leaves spreading more, have a different appearance. The lower leaves and tips of the upper ones are coloured of a fine reddish-brown. It is found in several other alpine districts of Europe, but nowhere common.

24. Bryum roseum, *Schreb.* (*Rosaceous Thyme Thread Moss.*) Leaves spreading, obovato-spathulate, acute, serrated, waved; nerve reaching to the point; capsule oblongo-ovate, pendulous.—*Eng. Fl. p.* 63; *Müll. Syn. pt.* 1. *p.* 247.

On grassy banks and heaths, especially such as are partially shaded; common. Fr. November. Bruch and Schimper, in speaking of this Moss, describe it as "the largest and most beautiful of all the European species. It is easily known by the shining rosette with which the stem is surmounted." In Britain the fructification is rare. We have had specimens gathered by the Rev. W. S. Hore, in Devonport, and the Rev. James Drummond has gathered it sparingly in the west of Scotland, but it is seldom met with in that state. Beautiful specimens in fruit have been sent from North American stations, where it is common. The beautiful horizontal tuft of leaves however makes amends for this want, and a secondary tuft is often protruded from its centre instead of a cluster of fruit-stalks. In habit it is closely allied to the species of which the succeeding section is composed.

** *Leaves with their margins evidently thickened.*

25. Bryum ligulatum, Schreb. (*Long-leaved Thyme*

Thread Moss.) Stems elongated; leaves undulate, ligulate, reticulated, their margins thickened, denticulate, the nerve reaching a little below the point; capsule ovate, pendulous; lid conical.—*Eng. Fl. p.* 63. Mnium undulatum, *Müll. Syn. pt.* 1. *p.* 161.

In woods and on moist banks, common. Fr. Spring. None who have traversed the woodland path but must have noticed the elegant tree-like branches and pale green waved foliage of this showy species. Bridel justly describes it as "pulchræ gentis pulcherrima," the loveliest of a lovely family; and adopting his sentiments, we have selected it as the principal embellishment for this little work. The barren branches, furnished with the largest foliage, are mostly procumbent, and have a tendency to form robts from various points of their surface. Its fruit, though by no means so rare as that of the preceding species, is not very abundant, at least in Britain, which Bruch and Schimper attribute to the greater isolation of its male and female flowers in our woods. Speaking of it as a *European* plant, these authors say, "It is met with everywhere in spring, loaded with capsules." This species is widely distributed in various countries, being found in fine condition in the Isle of Bourbon and at the Cape of Good Hope; and, unlike most of its con-

geners, it seems to court the society of man, growing and fruiting often very luxuriantly in the shady precincts of a garden or shrubbery.

26. BRYUM PUNCTATUM, *Schreb.* (*Dotted Thyme Thread Moss.*) Stems elongated; leaves obovato-rotundate, very obtuse, reticulated, their margins thickened, entire, the nerve disappearing below the summit; capsule ovate, pendulous; lid shortly rostrate.—*Eng. Fl. p.* 63. Mnium punctatum, *Müll. Syn. pt.* 1. *p.* 155.

By the rocky margin of streams, seeming to prefer growing near the roots of Alders and other trees affecting a moist soil. Fr. Spring. A large-leaved and elegant species, generally distributed in such localities as we have noted above. The foliage varies much, the depth of its green being, when growing on stones near the borders of springs, of a pale shade, while those plants growing on earth, or more in the shade, are of a dingy hue. The leaves also of the variety *aquaticum* of Hooker, are larger and more succulent, with the margins scarcely thickened.

A Moss, by some described as a species, and by others as only a variety of the above, and found both in Canada and on the European continent, has also been found in Lancashire by Messrs. Wilson and Nowell. This is the *Mnium*

Polytrichum commune

P aloides

Vincent Brooks imp

(*Bryum*) *pseudo-punctatum*, and *Bryum mnioides*, described in the 'London Journal of Botany' for 1843, and as *M. subglobosum*, Bruch and Schimper, in the 'Bryologia Europæa,' fasc. 31. Its chief distinction is its smaller size, and the different form of its capsule.

27. BRYUM ROSTRATUM, Schrad. (*Long-beaked Thyme Thread Moss.*) Stems elongated; leaves broadly ovate, reticulated, their margins thick, obtuse, denticulated; nerve reaching a little beyond the point; calyptra frequently persistent; capsule ovate, pendulous; lid rostrate.—*Eng. Fl. p.* 64. Mnium rostratum, *Müll. Syn. pt.* 1. *p.* 158.

In shaded situations, chiefly on sandy soils or rocks throughout the subalpine districts of Britain. Fr. May. This has much the habit and appearance of the preceding, with which it is frequently associated, but may be readily distinguished by its smaller size, creeping shoots, and differently formed capsule. There are several varieties of it, one or other of which are very generally distributed throughout both the temperate and tropical regions of the earth. The setæ are sometimes solitary, and at others springing in clusters from two to seven from the same point.

28. BRYUM MARGINATUM, Dicks. (*Thick-edged Thyme Thread Moss.*) Stems elongate; leaves ovate, acute, reti-

culated, their margins thickened, serrated; nerve reaching a little beyond the point; capsule ovate (or oblong), pendulous; lid shortly rostrate.—*Eng. Fl. p.* 64. Mnium serratum, *Müll. Syn. pt.* 1. *p.* 164.

On the ground in woods and in moist stony places of the more northern districts of England, Wales, and Ireland, and more frequently in the subalpine parts of Scotland. Fr. June. A small species of the section, but very neat and symmetrical in habit. Its foliage when growing is of a pale green colour, becoming somewhat lurid when in a dried state; and Bruch and Schimper mention a curious phenomenon regarding the foliage, viz. that these pale green branches, if moistened in water, assume a bluish tint. The margin and nerve of the leaf and the annulus of the capsule are usually of a deep red colour, and the calyptra also partakes of that shade.

29. Bryum hornum, Schreb. (*Swan's-neck Thyme Thread Moss.*) Stems elongated; leaves lanceolate, acute, reticulate, their margins thickened, denticulate; nerve generally disappearing below the summit; capsule oblongo-ovate, pendulous; lid hemispherical, mucronulate.—*Eng. Fl. p.* 64. Mnium hornum, *Müll. Syn. pt.* 1. *p.* 165.

In shady woods and on rocks, preferring spots where there

is a certain degree of moisture. Fr. Spring. A common but very showy species, whether we regard the pale green tufts of foliage, or the large pendulous capsule supported on its slender fruit-stalk. It seems to prefer mountainous districts, and does not occur on rocks of granitic formation.

30. BRYUM CUSPIDATUM, Schreb. (*Pointed-leaved Thyme Thread Moss.*) Stems elongated; leaves obovate, acuminulate, reticulated, their margins thickened, denticulated in the upper half; nerve running beyond the point; seta mostly solitary; capsule ovate, pendulous; lid conico-hemispherical, obtuse.—*Eng. Fl. p.* 64. Mnium cuspidatum, *Müll. Syn. pt.* 1. *p.* 180.

In woods, at the roots of trees, and on wet banks. Fr. April. A neat species, somewhat smaller than the preceding and furnished with creeping shoots, which, as in several other Mosses, take root at the extremities. It is regarded by Bruch and Schimper as the most generally distributed species in this section.

31. BRYUM AFFINE, Brid. (*Many-stalked Thyme Thread Moss.*) Stems elongated; leaves broadly elliptical, acuminulate, reticulated, their margins thickened, denticulated to the very base, the nerve reaching to or beyond the point; setæ aggregated; capsule oblong, pendulous; lid conical,

with a mucro.—*Eng. Fl. p.* 65. Mnium affine, *Müll. Syn. pt.* 1. *p.* 159.

First discovered in England, near Over, in Cheshire, by Mr. Wilson, and subsequently at Mildenhall, in Suffolk, where it was bearing fruit abundantly. It has also been found by the banks of the Findhorn, by Dr. Innes of Forres. Fr. Spring. This species is well denominated "allied," as it is no easy matter to distinguish it from some of the forms of *B. rostratum, cuspidatum,* and *marginatum.*

32. Bryum Tozeri; Grev. (*Minute Diaphanous Thread Moss.*) Stems short, simple, erect; leaves remote, spreading, obovate, entire, cuspidate, margined, loosely reticulated, the nerve disappearing beyond the middle; capsule drooping, somewhat pear-shaped; lid convexo-conical.—*Eng. Fl. p.* 65; *Müll. Syn. pt.* 1. *p.* 298.

On clayey ground by river-sides. First discovered by the river Dart, in Devonshire, by the Rev. I. S. Tozer; a station at Torquay, in the same county, is also given in the 'Phytologist' for 1843. Fr. Spring. The red-coloured cells which thicken the margin of the leaves of this rare little Moss, are the only marks of affinity with the *Mnium* section of the genus, for in every other respect it is closely allied to *B. carneum,* which affects similar soil for its place of growth.

B. Tozeri was first described and figured by Dr. Greville, in his interesting 'Scottish Cryptogamic Flora.' The only other station recorded for it as yet is "sandy clay soil, near St. Angelo in Sardinia." Of all this section it may be said,

"Thy home is in the wild,
'Mong sylvan shades, near music-haunted springs."

TIMMIA, *Hedw.*

Named in honour of J. C. Timm, a German botanist. This genus is intermediate between *Bryum* and *Polytrichum*.

Generic Character.—Seta terminal. Peristome double; the outer of sixteen teeth, the inner a plaited membrane, cut into thirty-two equal cilia, variously united at the base by transverse bars, and frequently cohering at the points. Calyptra dimidiate.

1. TIMMIA MEGAPOLITANA, Hedw. (*Mecklenburg Timmia.*) Stem one to three inches long; cauline leaves sheathing at the base, linear-lanceolate, pale and somewhat recurved, serrate and slightly carinate, furnished with a strong nerve reaching to the point, when dry falcate and incurved; capsule drooping or horizontal, oblong, pale brown and reddish when in an old state; peristome and its cilia furnished with

curious knots, plaitings, and projecting hairs.—*Eng. Fl. p.* 66; *Müll. Syn. pt.* 1. *p.* 189.

Rocks on the banks of the river Islay, Forfarshire; discovered by Mr. Drummond in 1824. The fruit of this interesting Moss has not been found in Britain, but from its being tolerably widely distributed in the mountainous districts of the Continent, our readers may in this way have opportunities of adding it to their herbarium. Its capsule at once reminds one of the larger species of *Bryum*, while its foliage is that of the *Catharinea* or *Atrichum* section of *Polytrichum*, and in this order it is placed by Bruch and Schimper.

BARTRAMIA, *Hedw.* (Apple Moss.)

Named in compliment to John Bartram, an American botanist and traveller. A natural and interesting genus, inhabiting our rocks, moors, and marshes. Some of the species have much affinity with other genera.

* *Seta elongated, straight.*

1. Bartramia pomiformis, *Hedw.* (*Common Apple Moss.*) Leaves patent, subulate, strongly serrated, twisted when dry, the nerve reaching to the summit; the stems

short; leaves flexuose.—*Eng. Fl. p.* 66; *Müll. Syn. pt.* 1. *p.* 499.

On rocks and dry banks. Fr. April. An elegant and well-known Moss, well designated, from its neatly globular capsule, *the* Apple Moss. The foliage is pale green, sometimes with a shade of verdigris.

A var. *major* of Hooker, and *crispa* of other authors, is frequently found, in which the leaves are longer and less closely set together, and in which the branches frequently overtop the capsules. It grows in mountainous districts.

2. BARTRAMIA ITHYPHYLLA, Brid. (*Straight-leaved Apple Moss.*) Stems short; leaves rigid, erecto-patent, subulato-setaceous, almost entire, the nerve half-way up, passing into the substance of the leaf, straight when dry; seta much elongated.—*Eng. Fl. p.* 66; *Müll. Syn. pt.* 1. *p.* 493.

Dry banks in subalpine districts. Fr. Spring. Much resembling the preceding, from which it is principally distinguished by its straight radiate leaves—hence the name—and their deeper green. This rigidity of the foliage is caused by the nerve in the upper half of the leaf dilating and uniting with the substance of the leaf. It is also closely allied to *B. patens*, Brid., a native of the Straits of Magellan and the Falkland Islands.

3. Bartramia gracilis, Flörker. (*Slender Apple Moss.*) Stems elongated; leaves recurvo-patent, lanceolate, canaliculate, serrated; seta lateral, from innovations.—*Eng. Fl. p.* 67; *Müll. Syn. pt.* 1. *p.* 508. Bartramia Oederi, Sw.

On rocks in alpine districts. Fr. June. This is one of our graceful mountain Mosses, easily distinguished by its spreading, recurved leaves, loosely set on the stems.

4. Bartramia fontana, Sw. (*Fountain Apple Moss.*) Stems fastigiate; leaves closely imbricated, rigid, erect, broadly ovate, or lanceolate acuminate, nearly plane, serrated; seta lateral, from innovations.—*Eng. Fl. p.* 67; *Müll. Syn. pt.* 1. *p.* 474.

By springs and the margins of streams in a turfy soil. Fr. Summer. A widely distributed species throughout the country, preferring mountainous or subalpine districts. In such localities nothing can exceed the beauty of its bright green foliage, and the graceful appearance of its branches and slender fruit-stalks supporting the large globular capsules; as these are found perfect at midsummer, they may easily be collected by the botanist when in pursuit of the flowering-plants with which it is then associated. It contrasts well with the white-starred *Stellaria*, trailing *Lysimachia*, and purple wood *Geranium*.

Bridel has described this and other allied species as a distinct genus, under the name of *Philonotis*, which recent authors employ only to mark a subdivision.

The var. *marchica* of Hooker, which is much smaller, with lanceolate acuminate leaves, is regarded by continental botanists as a distinct species. It is found in similar situations as the normal form, but not at such an altitude.

5. BARTRAMIA CALCAREA, Br. et Sch. (*Calcareous Apple Moss.*) Leaves secund or subsecund, crowded, ovato-acuminate, longer and thick-nerved; perigonial leaves all acutely acuminate, solid-nerved; the smaller peristome composed of remotely articulate teeth.—*Müll. Syn. pt.* 1. *p.* 475.

Moist, springy places, on limestone and basaltic rocks; fine in Teesdale. Fr. Summer. The secund direction of the foliage, its larger size, and the more lanceolate form of the individual leaves, are the chief marks of distinction from the preceding.

** *Seta very short, curved.*

6. BARTRAMIA HALLERIANA, *Hedw.* (*Hallerian Apple Moss.*) Stems much elongated, proliferous; leaves long, subulate, flexuose, serrated above; seta lateral, from innovations, very short, curved.—*Eng. Fl. p.* 67; *Müll. Syn. pt.* 1. *p.* 495.

In the damp crevices of quartz rocks in mountainous districts. In Scotland we have found it most frequent in the West Highlands, such as on the wild precipices of Glencoe. Fr. Summer. This is a large and fine species, distinguished by its broad and deep tufts, "clothing with their softness the moist crevices of the rocks on which it grows." It varies somewhat in size and in the density of its tufts.

7. BARTRAMIA ARCUATA, Brid. (*Curve-stalked Apple Moss.*) Stems much elongated, proliferous; leaves horizontally patent, ovato-lanceolate, acuminated, serrated, striated; seta very short, arcuate, at length lateral; capsule not furrowed.—*Eng. Fl. p.* 67; *Müll. Syn. pt.* 1. *p.* 487.

On moist rocks and banks, in subalpine districts, rare in fruit. Fr. Winter. An interesting Moss, on account of its being almost entirely confined to the British Isles; the only foreign habitat we are aware of being that recorded by Müller, the Rigi Mountain, in Switzerland, where it was found in a barren state. Its favourite localities seem to be the moist, gravelly banks, more or less shaded by heath and other dwarf plants, so frequent by some of the Highland "lochs," where its spreading golden tufts will arrest the gaze of even the unscientific eye, amid

"The mountain's unfrequented maze,
Deep moss and heather clothe the soil,
And many a springlet plays."

In these spots also the capsules are most likely to be found. The leaves are plaited longitudinally at the base, and do not, as in some other species, get twisted when in a dried state.

BUXBAUMIA, *Linn.* (Buxbaumia.)

Named in compliment to the original discoverer, Buxbaum, a German physician, who travelled much in the East, and published a work on the botany of Russia, and a Flora of Halle. As an instance of his modest feelings with regard to notoriety, it is recorded that he was at first disposed to dedicate it to the memory of his father, but was deterred by the fear of criticism having suggested to his mind the fable of the fox, who, in search of grapes for himself, was derided by the others for the pretence he made of getting them for his sick mother.

A curious genus, and the subject of various dissertations, since Linnæus devoted a paper to it in his 'Amœnitates Academicæ.'

Generic Character.—Capsule oblique, gibbous (or swollen). Peristome double, the outer of numerous, filiform, erect, jointless teeth; the inner a plaited membranous cone. Calyptra mitriform, minute.

1. BUXBAUMIA APHYLLA, *Hall.* (*Leafless Buxbaumia.*) Leaves very minute; lower ones ovate, deeply dentate; upper ones palmate, with long fringes; capsule smooth, the lower side membranaceous, the upper firm; apophysis small, cylindrical; seta red, tuberculated.

On the ground, mostly in or near woods, sometimes on the mountains. Sidlaw Hills, Forfarshire; at the foot of Ben Ledi, in Perthshire, associated with *Polytrichum.* Campsie Hills and Bowling Bay, G. I. Lyon, Esq. Fr. Spring. Its discovery as a British plant was first made by Sir W. J. Hooker at Sprowston, near Norwich, where it was found in a fir-plantation, and it has since been discovered in similar localities in Scotland. The late Mr. Gardiner, in his 'Flora of Forfarshire,' mentions particularly the number of specimens he gathered in several successive years on the Sidlaw Hills, near Dundee; and the details he gives, show that, like many others, the quantity and quality of the specimens depend much on the nature of the season.

We have already, in the Introductory Chapter, referred to

the appearance of this curious Moss, especially its *seemingly* leafless state, and would only here draw the attention of our readers to its curious capsule. Besides its oblique position, this organ, instead of being, as in almost all other Mosses, perfectly symmetrical and of uniform consistence in the substance of its walls, is formed of two sides of different appearance: the upper being flattened and of more delicate structure, while the lower is convex, darker-coloured, and of much firmer consistence. This gives it some resemblance to the hoof of a horse, whence the name, of Greek derivation, applied to it by Fabricius—*Hippopodium*.

B. indusiata, Brid., which British authors have regarded as the same plant, is now ranked as a species by Müller and others.

Section II. PLEUROCARPI.

Subsection 1. GYMNOSTOMI.

HEDWIGIA, *Hook.* (Hedwigia.)

This name denotes its origin from the "prince of Muscologists," J. G. Hedwig, than whom no one more deserves a fitting memorial of his labours. Ehrhart first applied the

name to the present *Anictangium ciliatum*, from which it was removed; and thus suppressed by succeeding botanists, Sir W. Hooker "ventured to separate (in the 'Musci Exotici') a group from *Anictangium*," which includes our British species.

Generic Character.—Seta lateral. Mouth of the capsule naked. Calyptra dimidiate.

HEDWIGIA ÆSTIVA, Hook. (*Summer Hedwigia.*) Stems elongated, densely tufted; leaves lanceolate, twisted when dry; capsule oval, smooth; lid with a long, oblique, subulate beak.—*Eng. Fl. p.* 68. Zygodon compactus, *Müll. Syn. pt.* 1. *p.* 683. Anictangium compactum, *Bryol. Europ. p.* 29, 30.

On wet shady rocks, especially such as are micaceous. Fr. Autumn. Very nearly allied to *Zygodon*, with which, it will be observed, it is united by a recent author. It is distinctly *pleurocarpous*.

SUBSECTION II. PERISTOMI.

Divison I. *APLOPERISTOMI.*

PTEROGONIUM, *Sw.* (PTEROGONIUM.)

A genus partaking of much of the character of some

Hypnums and *Neckeras*. Müller, it will be seen, now classes it with the latter. Name derived from its winged shoots or branches. The fruit of all the species is rarely produced.

Generic Character.—Seta lateral. Peristome single, of sixteen entire, equidistant teeth. Calyptra dimidiate.

1. PTEROGONIUM SMITHII, Sw. (*Curled Pterogonium.*) Stems much branched; branches pinnate; leaves ligulate, obtuse, entire, crisped when dry, their margins recurved, the nerve reaching about half-way up; seta very short; lid rostrate.—*Eng. Fl. p.* 69. Neckera Smithii, *Müll. Syn. pt.* 2. *p.* 118.

Trunks of trees in the south of England; common in Devonshire. Fr. (rare) Spring. This, as regards Britain, is a strictly southern species, and is found on the Continent only middle and south. It is a pretty species, and from its convolute branches and crisped leaves has been likened to a genus of Bridel's *Helicophyllum* (Spiral-leaf).

2. PTEROGONIUM GRACILE, Sw. (*Slender Pterogonium.*) Branches fascicled, curved; leaves broadly ovate, acute, concave, their margins plane, the summits serrated faintly, two-nerved at the base; lid conical.—*Eng. Fl. p.* 79; *Müll. Syn. pt.* 2. *p.* 97.

On rocks (rarely on the trunks of trees) in subalpine dis-

tricts. Fr. Winter. Müller well describes this as "one of the most beautiful of European Mosses." In dry weather its leaves are closely imbricated or overlapping each other on the branches, which then have a polished yellow lustre, while the slightest application of moisture causes the foliage to expand and spread out almost horizontally, so that in this condition, to the uninitiated eye, it cannot be recognized as the same plant. Those who have noticed the evening "sleep" of the leaflets of the *Acacia*, and the contrast then presented with their mid-day vigour, will be able to form some idea of the change that is effected in this plant. We must remind our readers, however, that these similar effects are the results of very different laws, and those at present under notice are easily explained by the *hygrometric* property of the foliage. Dillenius, and after him Weber and Mohr, applied the specific name *ornithopodioides*, "bird-foot like," to this species; and certainly, if we except the clustered pod of our little favourite *Ornithopus*, there are few objects in the vegetable world which more resemble the foot of the smaller members of the feathered tribes, than the branches of this Moss when in a dry state.

3. PTEROGONIUM FILIFORME, Schwægr. (*Filiforme Pterogonium.*) Stems irregularly branched, curved; leaves ovate,

Sphagnum obtusifolium

Schistostega pennata

Pterigonium filiforme

Fitch del. et lith

Vincent Brooks imp

subacuminated, concave, their margins recurved, serrated; nervé single or forked, short, faint; lid conical.—*Eng. Fl. p.* 70; *Müll. Syn. pl.* 2. *p.* 90.

On rocks and trunks of trees in the mountainous districts of Scotland and Ireland. Plentiful on Ben Lawers and other Breadalbane mountains. Fr. Spring and Summer. A smaller species than the preceding, which it resembles in having the foliage arranged in an imbricating and subsecund manner. From the larger cellules of the leaves, which give an inequality to their surface, there is a rough or papillosé appearance given to the whole plant, which distinguishes it at once from *P. filiforme.*

LEUCODON, *Schwægr.* (LEUCODON.)

So named from the white teeth of the peristome in the only British species, the one on which the genus was founded.

Generic Character.—Seta lateral. Peristome single, of thirty-two teeth, closely united in pairs.

1. LEUCODON SCIUROIDES, Schwægr. (*Squirrel-tail Leucodon.*) Leaves closely imbricated, ovato-cordate, acumi-

nated, striated; capsule oblong.—*Eng. Fl. p.* 70. Neckera sciuroides, *Müll. Syn. pt.* 2. *p.* 107.

Trunks of trees in the south of England, rare in Scotland. Fr. Summer. Messrs. Borrer and Lyell have found it in Sussex and Hants, in a fruiting state, but it rarely occurs in this condition. The stems however are often covered with numerous *gemmæ*, by which the plant seems to be freely propagated. Its habit is quite that of a *Hypnum*, in which genus it was placed by Linnæus. It is common on the Continent.

Division II. *DIPLOPERISTOMI.*

NECKERA, *Hedw.* (NECKERA.)

A genus approaching *Leskea* so much in the character of its peristome, and some *Hypnums* in that of its leaves and stems, that Drs. Hooker and Taylor, in the 'Muscologia Britannica,' say they would have been induced also to add this genus to *Hypnum*, "if it were not a genus so universally adopted, that we do not know of any author who has not kept it distinct." Those who have examined Müller's recently published Synopsis, will find that it ranks as an important genus in the most recent arrangements, no less

than one hundred and eighty-five species being there described. It is named in honour of N. I. Necker, whose valuable researches and writings on Muscology well merit such commemoration.

Generic Character.—Seta lateral. Peristome double; the outer of sixteen teeth, the inner of sixteen free cilia, or connected only at the very base by a short membrane. Calyptra dimidiate (mitriform in *N. pennata*).

1. NECKERA PUMILA, Hedw. (*Small Neckera.*) Leaves bifarious, ovato-acuminate, slightly concave, their margins recurved; seta scarcely longer than the perichætial leaves; capsule oblongo-ovate.—*Engl. Fl. p.* 71; *Müll. Syn. pt.* 2. *p.* 56.

On trees in the woods of Sussex and Hampshire, Cheshire and North Wales; at Inverary and Cleish, and in various places near the coasts of Wigton and Dumfries, in Scotland. Fr. Summer. This is the smallest of the British species, yet very neat and distinct from most of its congeners, if we except a common species of *Hypnum* (*H. complanatum*), growing in similar localities. It also is now classed by Müller as a *Neckera*.

2. NECKERA PENNATA, Hedw. (*Feathered Neckera.*) Leaves bifarious, ovato-lanceolate, acuminate, plane; capsule

sessile, oblong, immersed in the perichætial leaves.—*Eng. Fl. p.* 71; *Müll. Syn. pt.* 2. *p.* 50.

"On the trunk of a Beech-tree, at Fotheringham, near Forfar, very sparingly in fruit" (Drummond). Fr. Summer. This is one of our rarest British Mosses, though it seems not uncommon on the Continent, and still less so in America. It is easily distinguished by its sessile fruit.

3. NECKERA CRISPA, Hedw. (*Curled Neckera.*) Leaves bifarious, oblong, acuminulate, transversely waved; seta much exserted; capsule ovate.—*Eng. Fl. p.* 71; *Müll. Syn. pt.* 2. *p.* 54.

On trees and rocks, chiefly the latter, in subalpine districts. Fr. Winter. This is a large and beautiful Moss, covering large spaces on rocks in our Scottish Highlands. The largest specimens we remember to have gathered were on the braes of Lochaber, on rocks overhanging the mouth of the cave in which the unfortunate Pretender took refuge after his disastrous defeat at Culloden.

ANOMODON, *Hook. et Taylor.* (ANOMODON.)

The anomalous character of its peristome, is the origin of the name of this genus, having a ciliary process or thread

arising from each tooth, and thus not properly constituting a double peristome. This form is also found in *Orthotrichum* and *Daltonia*.

From not having any character in common with *Neckera* and *Hypnum*, with which previous botanists had connected it, Drs. Hooker and Taylor "thought it right to bring" the two species of which it is composed "into a separate genus."

Generic Character.—Seta lateral.. .Peristome double, consisting of sixteen teeth, with a ciliary process arising from each. Calyptra dimidiate.

1. ANOMODON CURTIPENDULUM, Hook. et Taylor. (*Pendulous Anomodon.*) Leaves ovate, acuminate, toothed, the nerve disappearing below the point; seta twice as long as the perichætium; capsule ovate.—*Eng. Fl. p.* 72; *Müll. Syn. pt.* 2. *p.* 115.

On rocks and trees, chiefly in mountainous districts. Fr. Spring. This is a strong-growing Moss, throwing out its *Hypnum*-like branches far and wide. It fruits but sparingly, but, in the absence of capsules, might be detected by its peculiarly dark-green foliage, which looks as if it had been subjected to a smoking process. The margin of the leaves are beautifully revolute, even to the point.

2. ANOMODON VITICULOSUM, Hook. et Taylor. (*Cylindrical Anomodon.*) Leaves ovato-lanceolate, obtuse, entire, the nerve reaching to the point; seta very long; capsule cylindrical.—*Eng. Fl. p.* 72. Hypnum viticulosum, *Müll. Syn. pt.* 2. *p.* 472.

On rocks and trees; sometimes, but not so frequent, on the ground. Fr. Spring. Very unlike its rambling friend we have previously described: while that, like a kangaroo, seems to overleap every obstacle, this, like a quiet hedgehog, loves to plant its soft pale green tufts beneath a shady rock or tree. It may easily be mistaken by beginners for some long-leaved *Dicranum*, or other allied Moss.

DALTONIA, *Hook. et Taylor.* (DALTONIA.)

Named in compliment to the Rev. Joseph Dalton, F.L.S., an English clergyman, distinguished for his botanical taste and other acquirements. He is justly eulogized by the authorities who instituted the genus.

Generic Character.—Peristome double, consisting of sixteen teeth, with a ciliary process arising from the side of each. Calyptra mitriform.

1. DALTONIA HETEROMALLA, Hook. et Taylor. (*Lateral*

Daltonia.) Leaves adpressed when dry, but spreading when moistened, concave, ovate, lanceolate, with entire recurved margins; nerve of the stem-leaves disappearing below the point, but that of the perichætium reaching the whole length; lid conico-acuminate; calyptra mitriform, somewhat fringed at the margin.—*Eng. Fl. p.* 72. Pilotrichum heteromalla, *Müll. Syn. pt.* 2. *p.* 167.

On trunks of trees in England and south of Ireland, much rarer in Scotland. Fr. Spring. This is an elegant Moss, fructifying freely, and covering with its matted branches the stems of trees on which it grows. A variety has been found near Limoges, in France, growing in a stream.

FONTINALIS, *Linn.* (Water Moss.)

All the species are found in fountains or streams, so that the name is an appropriate one. Müller, in his Synopsis, reduces this genus to a section of *Pilotrichum.*

Generic Character.—Seta lateral. Peristome double; the inner of sixteen cilia, connected by transverse bars, and forming a reticulated cone (a beautiful object). Calyptra mitriform.

1. Fontinalis antipyretica, Linn. (*Greater Water*

Moss.) Leaves nerveless, broadly ovate, complicato-carinate. —*Eng. Fl. p.* 73. Pilotrichum ha., *Müll. Syn. pt.* 2. *p.* 148.

On rocks and stones in rivers and streams, less frequently in stagnant waters, common. Fr. Summer. The dark lurid green of the leaves and stem of this Moss, which often exceeds a foot in length, are so easily detected, that we need not give any lengthened description of the plant. Its broadly ovate, plaited and imbricated leaves are arranged in a trifarious or three-rowed manner. Those of the perichætium are larger.

Its specific name, *antipyretica,* is in allusion to the purpose to which it is applied by the peasantry of Sweden, who, according to the account given by Linnæus, fill up the spaces between the chimney and wall of their houses, thus excluding the air and preventing the action of fire.

2. FONTINALIS SQUARROSA, Linn. (*Alpine Water Moss.*) Leaves nerveless, lanceolate, acuminate, plane.—*Eng. Fl. p.* 73. Pilotrichum s., *Müll. Syn. pt.* 2. *p.* 119.

In similar situations with the last, but chiefly confined to alpine districts. Fr. Summer. The smaller size, and plane instead of complicate leaves, seem the chief marks of distinction between this and the preceding species.

Fontinalis capillacea, described as a British species, and

said to have been gathered by Mr. Dickson, in "alpine rivulets, Scotland," is quite an American plant. It is supposed that the plant found by Dickson was *Weissia acuta*, growing in water, and lengthened out by that process.

HOOKERIA, *Sm.* (HOOKERIA.)

A genus consisting of large and beautiful mosses, as may be inferred from its including a "*gigantea*" and "*splendidissima*" among its foreign relations.

Named in honour of Sir W. J. Hooker, to whom British Muscologists are much indebted for the zeal and ability with which he has investigated this and other portions of the Flora of our own and other lands. The circumstance of this minute moss bearing his honoured name, reminds one of the graceful woodland *Linnæa*, dedicated to another *botanicorum princeps*.

Generic Character.—Seta lateral. Peristome double; the outer of sixteen teeth, the inner of sixteen cilia, united below into a membrane.

1. HOOKERIA LUCENS, Sm. (*Shining Hookeria.*) Leaves bifarious, broadly ovate, entire, obtuse, nerveless.—*Eng. Fl. p.* 74. *Müll. Syn. pt.* 2. *p.* 201.

On moist banks in woods, or among shaded rocks. Seemingly most abundant in the temperate districts of Britain and Ireland. Fr. Spring.

Both the foliage and fructification of this Moss are beautiful objects, and when once known will not be easily mistaken for any other vegetable form. The leaves are somewhat succulent and pellucid, from the large meshes glistening in damp shady spots in which it grows. While in a fresh state it has an odour which has been compared to that of the sweet violet.

2. HOOKERIA LÆTE-VIRENS, Hook. and Taylor. (*Deep Green Hookeria.*) Leaves bifarious, ovate, acuminulate, margined very obscurely, serrated at the extremity with two nerves reaching nearly the whole length.—*Eng. Fl. p.* 74. H. albicans, *Tayl. Fl. v.* 2. *p.* 36; *Müll. Syn. pt.* 2. *p.* 187.

Dunscombe Wood, near Cork, detected in 1815, by Mr. J. Drummond. O'Sullivan's Cascade and Turk Waterfall, Killarney, *W. H. Harvey, Esq.* Fr. November.

Smaller than the last, and darker in the shade of its green foliage. It is closely allied to, if not identical with *Leskea albicans*, from the West Indies, and seems to have a taste for a genial climate, as the authors of the 'Musco-

logia Britannica' mention that the temperature of the springs near which it has been found is higher than that of others in the neighbourhood.

3. HOOKERIA SPLACHNOIDES. (*Small Upright Hookeria.*) Leaves imbricated on all sides, erect, oblongo-lanceolate, nerve reaching nearly to the joint; calyptra fimbriated at the base.—*Eng. Fl. p.* 74. Daltonia s., *Musc. Brit. ed.* 1. *p.* 90. *Müll. Syn. pt.* 2. *p.* 17.

Discovered by Dr. Taylor on Secawn Mountain, near Dublin (since destroyed). "On moist inclined faces of rocks, usually near rills on the side of Turk Mountain and Cromaglown, near Killarney; rarely on trees."—*Wils.* Müller mentions its growing on branches of Heath-bushes. Fr. Winter. The range of this species seems also very limited, though there are species from the southern hemisphere, which seem nearly or quite identical. As far as habit is concerned, it is quite a *Daltonia.* For a minute description of this little Moss we refer our readers to Mr. Wilson's note in the Eng. Fl. p. 75.

HYPNUM, *Linn.* (FEATHER MOSS.)

The origin of the name of this genus is said to be from

two Greek words signifying "sleep," applied by Ray to it and its allies, "on account of some fancied soporiferous property."

It contains a great proportion of the Mosses, as Müller in his 'Synopsis' has enumerated no less than five hundred species, including of course *Leskea*, which had been made a separate genus by some Muscologists, on account of the internal cilia of the peristome being absent.

The general appearance the plants present is that of procumbent or trailing stems, branching, more or less irregularly, and throwing up from the axils of these stems the elegant capsules which contain their numerous spores.

Generic Character.—Sēta lateral. Peristome double; the outer of sixteen teeth; the inner of a membrane, cut into sixteen equal segments, with filiform processes (*cilia*) frequently placed between them. Calyptra dimidiate.

Section I. *Stems (taken in conjunction with the leaves) plane or flattened.*

Subsection 1. *Capsules erect.*

1. HYPNUM TRICHOMANOIDES, Linn. (*Blunt Fern-like Feather Moss.*) Leaves broadly scimitar-shaped, serrated at the point, nerve reaching to the middle of the leaf; cap-

sule ovate, erect; lid rostrate.—*Eng. Fl. p.* 75. *Müll. Syn. pt.* 2. *p.* 229.

At the base of the trunks of trees, and on clayey banks, under wood; not unfrequent. Fr. March. A neat species, fruiting freely, and readily distinguished by its curved glossy branches and scimitar-shaped leaves.

2. HYPNUM COMPLANATUM, Linn. (*Flat Feather Moss.*) Leaves oblong, apiculate, entire, with none or very faint nerves; capsule ovate, erect; lid rostrate.—*Eng. Fl. p.* 76. Neckera c., *Müll. Syn. pt.* 2. *p.* 43.

On trunks of trees, and rarely on rocks; luxuriating in localities where there is some degree of moisture. Fr. Spring.

This species much resembles a *Neckera*, especially the *N. pumila*, which is rare with us, as will be seen above. It has been removed to that genus by Müller. It rarely fruits, but is easily distinguished by its flattened green fronds, covering large spaces on the trunks of trees.

Subsection 2. *Capsules cernuous or inclined.*

3. HYPNUM RIPARIUM, Linn. (*Short-beaked Water Feather Moss.*) Stems loosely entwined, long and creeping; leaves ovato-lanceolate, acuminated, entire, the nerve reaching almost to the summit; capsules oblong,

cernuous; lid conical.—*Eng. Fl. p.* 76; *Müll. Syn. pt.* 2. *p.* 321.

Banks of streams, and other moist places on the ground, or adhering to sticks and stones. Fr. April.

This, like all marsh or aquatic plants, varies much, and Müller says it would be "entirely useless to enumerate all the forms it assumes." He has placed it in a subsection with "hooked branches" (*Drepanocladus*), in which we find *Hypnum uncinatum*, to which it is certainly more nearly allied than to the two succeeding species.

4. HYPNUM UNDULATUM, Linn. (*Waved Feather Moss.*) Leaves ovate, acute, transversely waved, with two faint nerves at the base; capsule oblong, furrowed, arcuato-cernuous; lid rostrate.—*Eng. Fl. p.* 76; *Müll. Syn. pt.* 2. *p.* 257.

On the ground, in dry or slightly moist or shady situations, ascending to a considerable height on the mountains. Fr. Spring. The pale flattened branches of this species readily distinguish it from its congeners. Its capsules are remarkable for being furrowed, thus giving it the same relation to *Hypnum* as *Mnium* bears to *Bryum*.

5. HYPNUM DENTICULATUM, Linn. (*Sharp Fern-like Feather Moss.*) Leaves ovate, sometimes approaching to

lanceolate, more or less acuminate, having two short nerves at the base; capsule oblongo-cylindraceous, inclined; lid conical.—*Eng. Fl. p.* 76; *Müll. Syn. pt.* 2. *p.* 251.

In shaded moist situations, on rocks or on the ground. Fr. Summer and Autumn. A common and very variable species. The varieties have been described as species by various authors, but we agree with Sir W. Hooker and other high authorities, in regarding them as mere varieties, from intermediate states being always found in their different places of growth. The var. *obtusifolium*, which is one of the most distinct, is found on the mountains.

Section II. *Stems* (*taken in conjunction with the leaves*) *more or less cylindrical, never plane.*

Subsection 1. *Leaves spreading on all sides.*†

A. *Leaves uniform in their direction.*‡

a. *Nerve reaching to or beyond the point.*

* *Leaves without serratures on the margin.*

6. HYPNUM MEDIUM, Dicks. (*Long-headed Feather Moss.*) Leaves ovate, obtuse, concave, entire, slightly falcato-secund, the nerve reaching to the summit; capsule cy-

† Not secund, or inclined to one side.

‡ Not squarrose, or with their points recurved.

lindrical, nearly erect; lid conical.—*Eng. Fl. p.* 77; H. polycarpon, *Müll. Syn. pt.* 2. *p.* 469.

On trunks, and at the roots of trees, affecting damp localities where Alders grow. Fr. Spring.

As will be seen from the specific description, this Moss has as much title to rank in the next Subsection as in the present, the leaves being often bent towards one side. A var. *exile* (*Leskea exilis* of Starck) is recorded by Müller; it has a more slender stem, and minute, lanceolate, acuminate leaves.

7. HYPNUM TENELLUM, Dicks. (*Tender Awl-leaved Feather Moss.*) Leaves fasciculated, erect, lanceolato-subulate, entire, their nerve reaching to the point; capsule ovate, cernuous; lid rostrate.—*Eng. Fl. p.* 77; *Müll. Syn. pt.* 2. *p.* 396.

On old walls and rocks, and, according to Müller, on the stems of old trees. Fr. Winter and Spring. A neat species, considerably allied to the two succeeding ones, though the author of the 'English Flora' well describes the points of difference. A synonym, or species of some, is *H. Algerianum*, from its having been found on Mount Atlas, in Africa, by Desfontaines, in 1795; it was also discovered on Mount Sinai, in Arabia, in 1816.

S. ampullaceum

Splachnum vasculosum

Tetraphis Browniana

Tetraphis pellucida.

8. HYPNUM SERPENS, Linn. (*Creeping White-veiled Feather Moss.*) Leaves ovato-lanceolate, rather obtuse, patent, entire, the nerve reaching to the summit or abbreviated; capsule cylindrical, curved, cernuous; lid conical.—*Eng. Fl. p.* 77; *Müll. Syn. pt.* 2. *p.* 411.

On stones, trunks of trees, moist banks, etc. Fr. Spring and Summer.

The numerous synonyms attached to this species by the standard authorities on Muscology, show that it is very variable, though its usual habit of growth and appearance is not apt to deceive. The length of the nerve—a character of some importance among *Hypnums*—is especially apt to vary. Its "white veil," covering the immature capsule, is a very pretty object.

** *Leaves serrated.*

9. HYPNUM POPULEUM, Hedw. (*Matted Feather Moss.*) Leaves erect, lanceolate, acuminated, serrated, the margin slightly reflexed, the nerve reaching to the point; capsule ovate, subcernuous; lid conical.—*Eng. Fl. p.* 78; *Müll. Syn.*

On stones, in shady situations; occasionally on trees. Fr. Autumn. A common species, greeting the eye of the Muscologist by every wayside.

10. HYPNUM REFLEXUM, Web. (*Reflexed Feather Moss.*)

Leaves cordato-acuminate, serrated, the margins slightly reflexed, the nerve reaching to the point; capsule ovate, cernuous; seta rough; lid conical.—*Eng. Fl. p.* 78; *Müll. Syn. pt.* 2. *p.* 448.

On lofty mountains. Ben Nevis and Ben Lawers, in Scotland, are the only two stations yet recorded as British. Fr. Autumn.

Though quite an alpine species, it has not been observed in the Arctic regions.

b. *Nerve shorter than the leaf, or none.*

* *Leaves entire.*

† *Leaves ovate or elliptical.*

11. HYPNUM MOLLE, Dicks. (*Soft Water Feather Moss.*) Stems creeping; branches erect; leaves loosely imbricated, patent, rotundato-ovate, rather acute, concave, entire, faintly two-nerved at the base, or with one short nerve; capsule ovate, cernuous; lid conical.—*Eng. Fl. p.* 78; *Grev. Sc. Crypt. Fl. pl.* 283; *Müll. Syn. pt.* 2. *p.* 431.

Alpine rivulets, Scotland. Fr. June.

12. HYPNUM ALPESTRE, Swartz. (*Mountain Water Feather Moss.*) Stems creeping; branches erect; leaves loosely imbricated, patent, rotundato-ovate, obtuse, concave, entire, rather rigid, nerve disappearing beyond the middle, or faintly

two-nerved at the base; capsule broadly oblong, cernuous; lid conical.—*Eng. Fl. p.* 79; *Grev. Sc. Crypt. Fl. pl.* 282. Hypnum molle, *Müll. Syn. pt.* 2. *p.* 431.

In similar situations with the last. Ben Challum, near Tyndrum, Scotland, Dr. Greville.

Müller, it will be seen, has united these species, but as they have been so accurately figured and described as species by Dr. Greville, in his valuable work, the 'Scottish Cryptogamic Flora,' we prefer letting them remain, though undoubtedly they are closely allied to each other.

13. HYPNUM TRIFARIUM, Web. (*Three-ranked Feather Moss.*) Leaves compactly and subtrifariously imbricated, ovate, obtuse, entire, concave, the nerve disappearing below the middle; capsule oblongo-ovate, cernuous; lid conical. —*Eng. Fl. p.* 79; *Müll. Syn. pt.* 2. *p.* 381.

Moist bogs on Ben Challum and Ben Lawers, Hooker and Greville. Craigcalleach, in Breadalbane, Dr. J. D. Hooker. Fr. Summer.

This is a rare and elegant species, entirely confined to alpine and northern regions. Its dark lurid colour and "three-ranked" foliage distinguish it from the succeeding species, to which it is otherwise closely allied.

14. HYPNUM STRAMINEUM, Dicks. (*Straw-like Feather*

Moss.) Leaves loosely imbricated, erecto-patent, oblongo-ovate, obtuse, entire, shining, the nerve reaching half-way; capsule oblongo-ovate, curved, cernuous; lid conical.—*Eng. Fl. p.* 79; *Müll. Syn. pt.* 2. *p.* 378.

Banks and wet bogs. Abundant on the Breadalbane Mountains, in Perthshire, but rare in fruit. In this state near Berwick-on-Tweed, Dr. Johnston. Fr. Summer.

Well marked by its "slender habit, pale colour, and obtuse leaves." It seems to bear fruit more freely in sandy ground, where the seta is frequently partially imbedded in the soil.

15. HYPNUM FLAVESCENS, Wils. (*Pale Yellow Feather Moss.*) Stems depressed and procumbent, thickly matted; leaves ovato-lanceolate, acuminate, entire, concave, with flattened margins, faintly two-curved at the base, erecto-patent and slightly secund; seta smooth; capsule ovate, cernuous; lid with a slender beak.—*Eng. Fl. p.* 79.

On moist rocks and by mountain-rills, at Killarney and Glengariff, Mr. Wilson.

While it has something peculiar in its foliage, this species has to our mind much affinity with *Hypnum rutabulum*. We should suppose it allied to the *Hypnum chrysostomum* of Rich, in Michaux's 'Flora Americana.'

16. HYPNUM MURALE, Hedw. (*Wall Feather Moss.*) Leaves nearly erect, imbricated, oval, with a very short point, concave, the single nerve reaching three-fourths of the way up; capsule ovate, cernuous; lid rostrate.—*Eng. Fl. p.* 80; *Müll. Syn. pt.* 2. *p.* 346.

On walls, moist stones, and by the sides of ditches, preferring, according to Müller, such as have a north aspect. Fr. Winter and Spring.

The habit of this species induced Dillenius to apply to it the designation of "mouse-tail like;" and other authors have described it as *Hypnum confertum* and *abbreviatum*. Its rostrate lid and concave sharp-pointed leaves form the marks by which it may be distinguished from its allies.

17. HYPNUM PURUM, Linn. (*Neat Meadow Feather Moss.*) Leaves closely imbricated, oval, with a very short point, very concave, the nerve reaching half-way up; capsule ovate, cernuous; lid conical.—*Eng. Fl. p.* 80; *Müll. Syn. pt.* 2. *p.* 379.

On banks and under trees, plentiful. Fr. (nowhere common) November to February.

This is a common but beautiful species, often mixing too freely in our lawns and pastures, to the exclusion of more useful productions. According to Dillenius, the appellation

purum, or "clean," given to it, is derived from the use made of it by fishermen in cleaning their nets. It certainly claims the title equally from its shining purity, almost rebuking the tread of the heedless passer-by.

18. HYPNUM PILIFERUM, Schreb. (*Hair-pointed Feather Moss.*) Leaves ovate, with a long narrow acumen, scarcely serrated, the nerve disappearing below the middle; capsule cernuous; lid rostrate.—*Eng. Fl. p.* 80; *Müll. Syn. pt.* 2. *p.* 369.

On banks and shady woods. Fr. Winter and Spring.

A species resembling *Hypnum rutabulum* in habit. From this and other allied species it is distinguished by its exactly ovate leaves, furnished with long slender points. It is rare in fruit, in which state it has been found near Edinburgh, and in Cotteral Wood, Cheshire.

19. HYPNUM SCHREBERI, Willd. (*Schreberian Feather Moss.*) Leaves closely imbricated, nearly erect, elliptical, apiculate, concave, entire, faintly two-nerved at the base; capsule ovate, cernuous; lid conical.—*Eng. Fl. p.* 80; *Müll. Syn. pt.* 2. *p.* 384.

In woods, among trees and bushes, frequent, but rare in fruit. Fr. Winter and Spring.

This species has been taken for a variety of *Hypnum*

purum by Ehrhart and other authors; but its more slender and compressed branches and reddish stems clearly mark it as a good species.

20. HYPNUM MONILIFORME, Wahl. (*Beaded Feather Moss.*) Leaves closely imbricated, rotundato-ovate, obtuse, very concave, ventricose, nerveless; capsule ovate, nearly erect.—*Eng. Fl. p.* 81. Hypnum julaceum, *Müll. Syn. pt.* 2. *p.* 465.

Breadalbane Mountains in Scotland, and Connemara in Ireland. Fr. Summer.

A distinct and beautiful moss, by some authors placed in the genera *Pterogonium* and *Leskea*. We believe its capsules have not yet been gathered in Britain; but as these occur in the mountainous districts of continental Europe and North America, collectors may be able to procure them from these localities.

21. HYPNUM CATENULATUM, Schwægr. (*Catenulated Feather Moss.*) Leaves subpatent, ovate, subacuminate, papillose on the back and margin, with a very short nerve; capsule ovate, inclined; lid conical, acuminate.—*Eng. Fl. p.* 81; *Müll. Syn. pt.* 2. *p.* 477.

Wet rocks and in woods. Ben Lawers, Dr. Greville. Campsie hills, near Glasgow, Dr. Arnott. Dargle and

Powerscourt, county Wicklow, Dr. Taylor. Mill Dingle, near Beaumaris, and woods near Bangor, Mr. Wilson. Fr. Summer. This species is also rare in fruit, and has been frequently taken for *Pterogonium filiforme*. It is found in the various mountain districts of Europe.

†† *Leaves lanceolate or subulate.*

‡ *Leaves without striæ.*

22. HYPNUM PLUMOSUM, Linn. (*Rusty Feather Moss.*) Leaves erecto-patent, the upper ones sometimes secund, all of them ovate-lanceolate, acuminate, subserrated, the margins recurved, the nerve reaching above the middle; capsule ovate, cernuous; lid conical.—*Eng. Fl. p.* 81; *Müll. Syn. pt.* 2. *p.* 358.

On moist banks, rocks, and stones, frequent. Fr. October. The glossy deep yellow-green leaves, which are often secured readily, distinguish this Moss from other species with which it is associated. It varies somewhat in habit however, whence in descriptive works various synonyms will be found.

23. HYPNUM DEMISSUM, Wils. (*Prostrate Feather Moss.*) Stem prostrate, with a few slender branches; leaves erect, subunilateral, elliptic-lanceolate, acute, nerveless, entire, the margin recurved; capsule elliptical, cernuous; lid with a long

beak.—*Wils. in Eng. Bot. Supp. tab.* 2740; *De Not. Syllab. Musc.* 1838. *p.* 57.

Cromagloun Mountain, Killarney; and near Kenmare, Ireland, "growing on the most inclined faces of detached rocks," Wilson, August 1829. Mr. Wilson describes it as "a distinct and very elegant little species," with glossy slender habit, and of compact growth. He has also found it near Beddgelert, in North Wales. De Notaris has found it on rocks in Italy, and Schimper in the lower Vosges.

24. HYPNUM PULCHELLUM, Dicks. (*Elegant Feather Moss.*) Leaves loosely imbricated, the upper ones subsecund, all of them lanceolato-acuminate, entire, nerveless; capsule ovato-cylindrical, nearly erect; lid conical.—*Eng. Fl. p.* 82; *Müll. Syn. pt.* 2. *p.* 277.

In alpine districts among rocks, preferring such spots as contain decaying vegetable matter. Fr. Autumn. A small species, well deserving its specific appellation of elegant or neat (*nitidulum*), as few objects can be more graceful than its tiny stems spreading their pale green foliage over the dark patches on which they grow. Its leaves spread out horizontally, like *H. denticulatum*, though the upper ones are subsecund.

‡‡ *Leaves striated.*

25. HYPNUM RUFESCENS, Dicks. (*Red Mountain Feather Moss.*) Leaves erecto-patent, lanceolate, acuminate, entire, striated, faintly two-nerved at the base; the capsule ovate, nearly erect; lid conical.—*Eng. Fl. p.* 82; *Müll. Syn. pt.* 2. *p.* 384.

On moist rocks in the alpine districts of Scotland. Only recently discovered to be a native of Ireland by Dr. Dickie, of Belfast, who gathered it on Ben Bulben. Fr. (rare) Summer. The stems are erect, and vary considerably in size. Well distinguished by the yellowish-purple colour of its glossy foliage. It is found throughout the mountain-ranges of Europe in similar localities as those of Britain.

26. HYPNUM POLYANTHOS. (*Many-fruited Feather Moss.*) Leaves erecto-patent, ovato-lanceolate, remarkably acuminate, minutely serrated at the point, smooth, obscurely two-nerved at the base; capsule ovato-cylindrical, erect; lid conico-acuminate.—*Eng. Fl. p.* 82. H. Polyanthum, *Müll. Syn. pt.* 2. *p.* 337.

On rocks and trees. First found in England by Mr. W. Backhouse on apple-trees near Darlington; also about Forfar, Scotland, by Mr. Drummond. Fr. Autumn and

Winter. In addition to the appended specific description, various details regarding the appearance of this species will be found in the works we refer to. It may readily be taken for one of the small varieties of *H. cupressiforme*. Müller records a variety *pallidifolium* which he regards as identical with the *H. multiflorum* of Taylor in 'Flora Hibernica,' vol. ii. p. 46.

27. HYPNUM SERICEUM, Linn. (*Silky Feather Moss.*) Leaves erecto-patent, lanceolate, acuminate, entire or slightly serrated, the nerve reaching to three-fourths of the length; capsule ovato-cylindrical; seta rough; lid conical.—*Eng. Fl. p.* 83; *Müll. Syn. pt.* 2. *p.* 356.

On trunks of trees, less frequently on walls or rocks. Fr. Winter and Spring. The soft yellow cushions which this species forms where it grows, render it a very neat and distinct object. When young, the calyptra is hairy.

28. HYPNUM SALEBROSUM, Hoffm. (*Smooth-stalked Yellow Feather Moss.*) Leaves erecto-patent, lanceolate, acuminated into a waved, hair-like, scarcely serrulate point, striated, the nerve disappearing above the middle; capsule ovate-cernuous; seta smooth; lid conico-acuminate.—*Eng. Fl. p.* 83. H. plumosum, *var.* Salebrosum, *Müll. Syn. pt.* 2. *p.* 359.

On banks and rocks. Cotteral Wood, near Manchester, Mr. Hobson. Near the Loch of Forfar, Scotland, Mr. Drummond. Fr. Winter and Spring. It will be observed that Müller regards this as only a variety of *H. plumosum*, to which and *H. lutescens* it is nearly allied. Its leaves are of a pale green shade of colour, are thin and flaccid, and have tapering, waved points. Found throughout Europe, as far as Lapland.

29. HYPNUM LUTESCENS, Huds. (*Rough-stalked Yellow Feather Moss.*) Leaves erecto-patent, lanceolate, acuminate, entire, striated, the nerve disappearing below the point; capsule ovate, cernuous; seta rough; lid shortly rostrate.—*Eng. Fl. p.* 83; *Müll. Syn. pt.* 2. *p.* 370.

On banks, and on the stems of trees and bushes near the ground, preferring a clayey soil. Fr. Spring.

30. HYPNUM NITENS, Schreb. (*Shining Feather Moss.*) Leaves erecto-patent, lanceolato-subulate, acuminate, nearly entire, striated, the nerve running almost to the point; capsule oblong-ovate, curved, cernuous; seta smooth; lid conical. —*Eng. Fl. p.* 83; *Müll. Syn. pt.* 2. *p.* 381.

Bogs and marshes, seemingly confined to the east of England and Scotland. It is rare in fruit, in which state it is found in Yorkshire by the Rev. James Dalton.

31. HYPNUM ALBICANS, Neck. (*Whitish Feather Moss.*) Leaves erect, ovato-lanceolate, acuminate, faintly striated, concave, entire, revolute at the margin, the nerve reaching half-way; capsules ovate, cernuous; seta smooth; lid conical. —*Eng. Fl. p.* 84; *Müll. Syn. pt.* 2. *p.* 360.

On the ground and sandy banks. Fr. November. As the name indicates, this is a pale-coloured species, in which, as well as other particulars, it resembles *Hypnum lutescens.* The leaves are longer, more pointed and spreading, than in that species. In moist places the stems are stronger and more branched.

** *Leaves serrated.*

† *Stems below bare of leaves, resembling a tree.*

32. HYPNUM ALOPECURUM, Linn. (*Fox-tail Feather Moss.*) Stems erect, simple and naked below, fascicled above; leaves concave, narrow, ovate, acute, serrated, reflexed at the margin, the nerve reaching nearly to the point; capsule ovate, cernuous; lid rostrate.—*Eng. Fl. p.* 84; *Müll. Syn. pt.* 2. *p.* 501.

Woods and shady banks, preferring the neighbourhood of streams. Fr. Winter. This and the succeeding species are very graceful objects, and belong to the section in which the largest and handsomest forms are found. It is rare

in fruit both in this country and in America, and does not extend to the Arctic regions.

33. HYPNUM DENDROIDES, Linn. (*Tree-like Feather Moss.*) Stems erect, below simple and naked, fascicled above; leaves ovate, often more or less lanceolate, serrated at the point, the nerve reaching nearly to the summit; capsule ovato-cylindrical, the lid rostrate.—*Eng. Fl. p.* 84. Neckera dendroides, *Müll. Syn. pt.* 2. *p.* 121. Climacium dendroides, *Web. and Mohr, Bryol. Europ. fasc.* 16.

In woods and pastures, and in the vicinity of bogs and marshes. Fr. Winter. This graceful species seems to prefer subalpine districts, and is rare in fruit, to perfect which a good supply of moisture seems necessary. The columella is well developed in its capsules, for a description of which, as well as other peculiarities of structure, we refer to the various authors who have devoted themselves to its study.

†† *Stems leafy below.*

‡ *Capsules erect.*

34. HYPNUM CURVATUM, Swartz. (*Curved Feather Moss.*) Branches fascicled, curved; leaves ovato-elliptical, concave, serrated at the point, the nerve disappearing be-

yond the middle; capsule ovate, erect; lid rostrate.—*Eng. Fl. p.* 85. Hypnum myurum, *Müll. Syn. pt.* 2. *p.* 499.

On trees and rocks. Fr. Winter and Spring. The elegantly curved branches of this species make it readily distinguishable from most of its congeners. It has, at first glance, much of a tree-like form, but, on examination, it will be found that its stems are leafy throughout.

35. HYPNUM MYOSUROIDES, Linn. (*Mouse-tail Feather Moss.*) Branches fascicled, curved; leaves lanceolato-acuminate, serrated at the margin, inflexed at the base, the nerve disappearing near the middle; capsule ovato-cylindrical, erect, the lid rostrate.—*Eng. Fl. p.* 85; *Müll. Syn. pt.* 2. *p.* 499.

On stems of trees, generally near the base, less frequently on rocks. Fr. Autumn. With much of the habit of the preceding species, this is a more slender plant, with "more acuminate, less concave leaves," which have also a "shorter nerve and reflexed margins." A large variety has been found by Mr. Wilson on Conner Hill, near Brandon Mountain, Ireland.

‡‡ *Capsules cernuous, or drooping.*

§ *Stems twice or thrice pinnate.*

36. HYPNUM SPLENDENS, Hedw. (*Glittering Feather*

Moss.) Stems tripinnate; leaves ovate, with a suddenly acuminated point, concave, faintly two-nerved at the base, the margin recurved below; capsule ovate, cernuous; lid rostrate.—*Eng. Fl. p.* 85; *Müll. Syn. pt.* 2. *p.* 457.

In woods and on hedge-banks, heaths, etc., more abundant where there is a degree of shade. Fr. Spring. The glossy or "glittering" stems of this common but elegant species cannot but fail to attract the notice of the most careless observer, whether he traverses the woodland in the height of summer or depth of winter. It is found throughout North America and Northern Asia, but nowhere are its capsules abundant.

37. HYPNUM UMBRATUM. (*Shaded Feather Moss.*) Stem procumbent, irregularly pinnate, the branchlets deflexed; leaves cordate or lanceolate, acuminate, plicato-sulcate, two-nerved, smooth and glistening, remotely and irregularly serrulate; footstalk of the capsule flexuous; theca inclined, ovate; lid short, conical, slightly apiculate. Hylocomium umbratum, *Br. and Sch., Bryol. Europ. fascic.* 49; *Müll. Syn. pt.* 2. *p.* 457.

In woods and other shady spots in alpine and subalpine districts. Glen Dole, Clova, among the willows; Trosachs, near Loch Katrine,

Timmia megapolitana

Tortula rigida

Tortula subulata

38. HYPNUM PROLIFERUM, Linn. (*Proliferous Feather Moss.*) Stems tripinnate; leaves serrated, papillose on the back, the cauline ones cordato-acuminate, striated, with a nerve running nearly to the point; those of the branches more ovate, with a single or double nerve at the base; lid conico-rostrate.—*Eng. Fl. p.* 85. H. tamariscinum, *Müll. Syn. pt.* 2. *p.* 483.

Woods and banks in heathy places, abundant. This is also a graceful and widely distributed moss, having been found in almost every part of the world. It will readily be known by its opaque yellowish-green foliage. Both the preceding species will attract attention in a bright winter day,

> "Glittering with yellow, red, and green,
> As o'er the moss, with playful glide,
> The sunbeams dance from side to side."

39. HYPNUM PRÆLONGUM, Linn. (*Very Long Feather Moss.*) Stems sub-bipinnate; leaves distinctly placed, patent, cordate or ovate, acuminate, serrated, the nerve disappearing below the summit; capsule ovate, cernuous; lid rostrate.—*Eng. Fl. p.* 86; *Müll. Syn. pt.* 2. *p.* 446.

On moist shaded banks and the stems of decaying trees, common. Fr. Winter. A graceful but variable species.

Müller regards the variety *Stokesi*, with thickly-set bipinnate branches, as a distinct species.

§§ *Stems pinnate, or irregularly branched.*

40. HYPNUM FLAGELLARE, Dicks. (*Flagellate Feather Moss.*) Stems pinnate (or irregularly bipinnate); leaves thickly set, cordato-acuminate, serrated, very faintly two-nerved at the base; capsule ovato-oblong, cernuous; lid conical.—*Eng. Fl. p.* 86; *Müll. Syn. pt.* 2. *p.* 436.

Rocks in the neighbourhood of streams; discovered first by Mr. Dickson in the west of Scotland and in Ireland; rare in fruit, in which state Mr. Wilson has discovered it in North Wales, and more abundantly in Ireland. Bridel compared it to *H. commutatum*, whence a synonym *H. pseudo-commutatum*, from which, however, it is sufficiently distinct by its habit and other characters. A very pretty species.

41. HYPNUM MICANS. (*Sparkling Feather Moss.*) Leaves patent; roundish-ovate, slightly acuminate, concave, serrated above, the margin flattened below, or reflexed, two-nerved at the base.—*Eng. Fl. p.* 86; *Mackay's Fl. Hib. v.* 2. *p.* 42; *Müll. Syn. pt.* 2. *p.* 290.

Woods at Glengariff, near Killarney; discovered by Miss Hutchins; "always barren," with much the habit of *Hyp. flavescens*, and some varieties of *H. cupressiforme*. This

seems, from the authority of eminent muscologists who have examined it, justly entitled to rank as a species. Wilson traces much affinity in habit between it and *Hypnum flagellare.*

42. HYPNUM ABIETINUM, Linn. (*Spruce-tree Feather Moss.*) Stems pinnate; leaves papillose on the back and on the slightly reflexed margins, the nerve running nearly to the point, those of the stems ovato-acuminate, striated, those of the branches ovato-lanceolate; capsules cylindrical, inclined; lid conical.—*Eng. Fl. p.* 87; *Müll. Syn. pt.* 2. *p.* 482.

On the ground in mountainous districts, affecting soils of a calcareous nature. It is sometimes found near the level of the sea, as on the sands of Barrie, near Dundee. Fr. (rare, and we believe unknown in Britain) Autumn. This is an elegant and distinct species, and the specific name is an appropriate one. It has been found throughout Europe and North America, but always rare in fruit.

43. HYPNUM BLANDOVII, Weber and Mohr. (*Blandow's Feather Moss.*) Stems pinnate, serrated, smooth on the back, the margins reflexed, those of the stem cordato-acute, with a short nerve, those of the branches ovato-acuminate, with the nerve disappearing beyond the middle; capsule

cylindrical, inclined; lid conical.—*Eng. Fl. p.* 87; *Müll. Syn. pt.* 2. *p.* 454.

Rocks in subalpine countries. Discovered by Joseph Woods, Esq., at Tunbridge, in Kent, but always barren. It was first distinguished by Mohr from the preceding species, who says, that it differs "as *H. splendens* does from *H. proliferum.*" Found in most boggy meadows throughout Germany, the north of Europe, and America.

44. HYPNUM BLANDUM. (*Neat Feather Moss.*) Stems somewhat pinnate; leaves closely imbricated, nearly erect, ovate, very concave, almost keeled above, apiculate, smooth, the margins plane, serrulated, the nerve disappearing below the point; seta rough; lid conico-acuminate.—*Eng. Fl. p.* 88. H. illecebrum, *Müll. Syn. pt.* 2. *p.* 376.

Discovered by Mr. Lyell on a bank in Cadnam Lane, New Forest, Hants, and described as a new species by Sir W. Hooker in the 'Flora Londinensis' (new series). Mr. Wilson has subsequently found it about Aberffraw, Anglesea, and near Bangor in Wales. Fr. November. Allied to *H. murale* and *rutabulum*, and still more so to a continental species, *H. cirrhosum.* It is found throughout Italy, France, Germany, Algeria, and other countries.

45. HYPNUM CRASSINERVIUM. (*Thick-nerved Feather*

Moss.) Stem creeping, with simple, fasciculated, erect branches; leaves spreading, ovate, acuminate, concave, with reflexed serrated margins, nerved more than half-way; capsule narrow, ovate; fruit-stalk rough; lid rostrate.—*Eng. Fl. p.* 88; *Müll. Syn. pt.* 2. 371.

Limestone and calcareous rocks; first discovered in the south of Ireland, at Killarney and other places, by Dr. Taylor. Mr. Wilson found it subsequently in Wales, and Mr. Drummond on Cave Hill, Belfast. Fr. (occasionally) October. This species is allied to *H. piliferum*, but easily distinguished by its foliage. It has been found in the Pyrenees by Mr. Spruce, and by various individuals on the other mountain-ranges of Europe.

46. HYPNUM RUTABULUM, Linn. (*Common Rough-stalked Feather Moss.*) Stems variously branched; leaves patent, ovate, acuminate, serrated at the points, striated, the nerve reaching half-way; capsule ovate, cernuous; seta rough; lid conical.—*Eng. Fl. p.* 88; *Müll. Syn. pt.* 2. *p.* 367.

On the ground, decaying wood, stones, and rocks, everywhere common. Fr. Winter and Spring. This may be regarded as the commonest of the British Mosses, as it is by no means nice as to where it grows. In the open field or shaded wood, by rock or streamlet, in dry or moist

weather, its spreading branches may be found covering the earth with their verdant shade. It is equally common throughout Europe and North America. There are several varieties of it described, as it is a polymorphous species, the most distinct of which seems to be *campestre*, with a smoother footstalk, and slightly appendiculate internal cilia. It is found in dry situations.

47. HYPNUM VELUTINUM, Linn. (*Velvet Feather Moss.*) Stems variously branched; leaves erecto-patent, ovate, often approaching to lanceolate, acuminate, serrated, striated, the nerve reaching half-way; capsule ovate, cernuous; seta rough; lid conical.—*Eng. Fl.* 89; *Müll. Syn. pt.* 2. *p.* 399.

In woods and on hedgebanks, common. Fr. Spring. This common moss is so nearly allied to the preceding species, that Hooker, Wilson, and others, have doubted its claims to rank as a species; for "except in its smaller size, somewhat narrower leaves, and their more upright direction," no good points of distinction can be found. Müller however retains it in his work, with three varieties, therefore we have thought it best to let it so remain.

48. HYPNUM RUSCIFOLIUM, Neck. (*Long-beaked Water Feather Moss.*) Stems variously branched; leaves loosely imbricated, subpatent, broadly acute, serrated, concave, the

nerve reaching nearly to the summit; capsule ovate, cernuous; lid rostrate.—*Eng. Fl. p.* 89. H. rusciforme, *Müll. Syn. pt.* 2. *p.* 425.

On stones, wood, and rocks in streams, delighting in such spots as afford a fall to the water. Fr. Winter.

"Where, through some meadows soft and green,
Gemm'd with the daisy's silver bloom,
A gentle stream is wandering seen,
'Midst flowering banks of rare perfume;
There you may look beneath the waters
Sweetly gliding on serene,
For one of Beauty's lovely daughters,—
Lovely though of humble mien:
And where the stream, in childish glee,
Leaps o'er the rocks with infant pride,
This little Moss, in eddying swirl
Of foaming waves, its head doth hide."

It varies a good deal in the length of the stem and size of the leaves, according to the situation in which it grows.

49. HYPNUM STRIATUM, Schreb. (*Common Striated Feather Moss.*) Stems variously branched; leaves patent, cordato-acuminate, serrated, striated, the nerve reaching beyond the middle; capsule oblongo-ovate, cernuous; seta smooth; lid rostrate.—*Eng. Fl. p.* 89; *Müll. Syn. pt.* 2. *p.* 460.

Shady woods, and at the roots of trees. Fr. Spring. Another common but elegant species, closely allied in most respects to *H. brevirostre.*

50. HYPNUM CONFERTUM, Dicks. (*Clustered Feather Moss.*) Stems variously branched; leaves erecto-patent, ovato-acuminate, concave, serrated, their nerve reaching half-way; capsule ovate, cernuous; seta smooth; lid rostrate.—*Eng. Fl. p.* 89; *Müll. Syn. pt.* 2. *p.* 345.

On trunks of trees, banks, and rocky ground. Fr. Winter. This species has many synonyms, which various authors have classed as species. The most marked variety found with us is one with subsecund leaves, found growing on trees.

B. *Leaves squarrose.*

51. HYPNUM CUSPIDATUM, Linn. (*Pointed Bog Feather Moss.*) Leaves loosely set, ovate, concave, nerveless, entire, the lower ones squarrose, those at the summit closely imbricated into a cuspidate point; capsule oblong, curved, cernuous; lid conical.—*Eng. Fl. p.* 90; *Müll. Syn. pt.* 2. *p.* 383.

In bogs and marshy ground. Fr. Summer and Autumn. This and the next species are very similar in habit; but the present may be distinguished by the sharp cuspidate points

of its leaves; when growing in water, these attain a large size. It is very common also in North America and Asia, as far as the Polar regions.

52. HYPNUM CORDIFOLIUM, Hedw. (*Heart-leaved Feather Moss.*) Leaves loosely set, squarrose, cordato-ovate, obtuse, concave, entire, the nerve reaching very nearly to the point; capsule oblong, curved, cernuous; lid conical.—*Eng. Fl. p.* 90; *Müll. Syn. pt.* 2. *p.* 379.

In similar localities as the preceding. Fr. Spring. Much resembling the preceding, and chiefly distinguished by the well-defined nerves of the leaves. A purple variety grows in alpine situations, which is usually barren; indeed, in no situation does it seem a species that fruits freely.

53. HYPNUM STELLATUM, Schreb. (*Yellow Starry Feather Moss.*) Leaves loosely set, squarrose, cordate, much acuminated, entire, (mostly) nerveless; capsule oblongo-ovate, curved, cernuous, the lid conical.—*Eng. Fl. p.* 90; *Müll. Syn. pt.* 2. *p.* 435.

In marshes and damp ground. Fr. Spring. A well-marked species, of a fine yellowish-brown colour. The direction and arrangement of the leaves give them a stellate, or star-shaped, appearance, whence the specific name. We have omitted, as a species, the *H. polymorphum* of Hedwig,

and record it here, under Müller's name, var. *tenellum*. It is smaller in all its parts, and often has a distinct nerve reaching half-way up the leaf.

54. HYPNUM HALLERI, Linn. (*Hallerian Feather Moss.*) Stems creeping, with short erect branches; leaves broadly ovate, acuminate, serrated very obscurely and shortly, two-nerved, their extremities remarkably recurved; capsule oblongo-ovate, cernuous; lid conical.—*Eng. Fl. p.* 91; *Müll. Syn. pt.* 2. *p.* 440.

Moist rocks on Ben Lawers, Scotland, very rare, where we believe it was discovered by a trio well known to muscologists,—Hooker, Arnott, and Greville; reported to have been found in Herefordshire by Mr. Dickson. Fr. May. The regular and much recurved foliage of this species renders it a very elegant moss. Though one of the rarest of British *Hypnums*, it is found abundantly in the alpine districts of the continent, especially in Switzerland, where Haller first gathered it. Drummond also discovered it on the Rocky Mountains of North America.

55. HYPNUM DIMORPHUM, Brid. (*Dimorphous Feather Moss.*) Stems vaguely pinnated; leaves cordato-ovate, concave, serrulated, erecto-patent, obscurely two-nerved at the base, those of the stems acuminated and reflexed at the

extremity, those of the branches acute and nearly straight; capsulę ovate, cernuous, the lid conical.—*Eng. Fl. p.* 91; *Müll. Syn. pt.* 2. *p.* 490.

Under shady rocks on Ben Lawers, Dr. Arnott. Fr. Spring. Much resembling the preceding, of which Schwægrichen and Wilson regard it as a variety. Müller says it is found throughout the whole of Europe in subalpine districts, and in some parts of North America.

56. HYPNUM LORĒUM, Linn. (*Rambling Mountain Feather Moss.*) Leaves recurved, squarrose, lanceolate, much acuminated, concave, serrated, striated, faintly two-nerved at the base; capsule ovato-globose, cernuous; lid hemispherical, suddenly apiculated.—*Eng. Fl. p.* 91; *Müll. Syn. pt.* 2. *p.* 442.

On the ground in woods, and among bushes on moors. Fr. Winter. The specific English name is an appropriate one, as its long rambling wiry branches remind us more of the stringy garlands of *Lycopodium*, or Club-moss, than any other species of *Hypnum*. The lower branches have a tendency to produce roots, and are somewhat tapering or attenuated.

57. HYPNUM TRIQUETRŪM, Linn. (*Triquetrous Feather Moss.*) Leaves squarrose, cordate, gradually acuminated,

plane, serrated, faintly striated, with two nerves at the base; capsule ovato-globose; lid conical.—*Eng. Fl. p.* 91; *Müll. Syn. pt.* 2. *p.* 444.

In dry woods, and frequently on rocks, abundant. Fr. (not very abundantly) Autumn and Winter. A well-known and robust species, met with in most woods, frequently covering the shaded rocks to a considerable depth. The stems are arranged in a pinnate form, and are much thickened at the extremity. Though common throughout Europe, it seems a somewhat rare species in North America.

58. HYPNUM BREVIROSTRE, Ehrh. (*Common Rough-stalked Feather Moss.*) Leaves squarrose, broadly ovate, concave, often striated, acuminated suddenly and with an evident contraction, so as to terminate in a long narrow point, serrated faintly, two-nerved at the base; capsule ovate; lid short, conical.—*Eng. Fl. p.* 92; *Müll. Syn. pt.* 2. *p.* 459.

In shady woods at the roots of trees. Found in various localities throughout Britain and Ireland, and probably not very rare. "The observant (*oculatissimus*) Ehrhart first detected it in Hercynia." Fr. Spring. This, like the former (of which by various authors it was at one time regarded as a variety) is a robust and graceful Moss. Besides the

difference in the form of its leaves and capsules, its branches are more erect, and do not root as in the preceding species.

59. HYPNUM SQUARROSUM, Linn. (*Drooping-leaved Feather Moss.*) Leaves squarrose, widely cordate, very much acuminated and recurved, serrated faintly, two-nerved at the base; capsule ovato-globose, cernuous; lid conical.—*Eng. Fl. p.* 92; *Müll. Syn. pt.* 2. *p.* 443.

Woods, heaths, and among moist and shaded grass, common. Fr. (nowhere abundant) Winter. With much of the habit of the three preceding, this species will readily be distinguished by its more slender and shorter stems, as well as the more lively shade of its green.

Subsection 2. *Leaves secund.*

A. *Leaves with a single nerve.*

60. HYPNUM FILICINUM, Linn. (*Lesser Golden Fern Feather Moss.*) Branches pinnate; leaves, especially the upper ones, falcato-secund, broadly ovate, acuminate, serrated, their nerves reaching to the point; capsule oblongo-ovate, curved, cernuous; lid conical.—*Eng. Fl. p.* 92; *Müll. Syn. pt.* 2. *p.* 419.

Marshy ground, and near rivulets. Fr. (not frequent) Spring. This is a variable species, and its various forms have been described as different species by some musco-

logists. The beginner is most likely to mistake some of these forms for *H. commutatum*, in which the nerve of the leaf is shorter, and its direction less falcate.

> "I oft have mark'd, upon the jutting rocks
> That skirt a pool, recipient of the stream
> After a playful leap, a shining moss,
> Of golden hue, that won my admiration
> By its rare beauty."

61. HYPNUM ATRO-VIRENS, Dicks. (*Dark-green Feather Moss.*) Branches procumbent; leaves all slightly secund, broadly ovate, with an attenuated obtuse point, the nerve running nearly to the summit; capsule ovate, cernuous; lid conical.—*Eng. Fl. p.* 93. H. filamentosum, *Bertol., Müll. Syn. pt.* 2. *p.* 178.

On rocks and trees, in mountainous districts. Fr. Spring. A good deal like the preceding species, but distinguishable from it and others, besides the minute details of structure, by its procumbent habit, and the thicker and softer texture of its foliage.

62. HYPNUM PALUSTRE, Linn. (*Marsh Feather Moss.*) Leaves secund, ovate, somewhat acuminate, concave, entire, the margins incurved above, the nerve short, often forked, sometimes obsolete; capsule oblongo-ovate, cernuous; lid conical.—*Eng. Fl. p.* 93; *Müll. Syn. pt.* 2. *p.* 424.

Wet rocks, stones, etc., by stagnant or running water. Fr. Spring. A neat species, varying a good deal in some particulars, especially so in colour, which is sometimes a deep lurid green, and occasionally of a warm yellow tint. A variety (sp. of Funck) named *H. subsphærocarpum*, is found in alpine rivulets.

63. HYPNUM FLUITANS, Linn. (*Floating Feather Moss.*) Leaves loosely imbricated, the upper ones especially, falcato-secund, all lanceolato-subulate, scarcely serrated at their points, the nerve reaching nearly to the summit; capsule ovato-oblong, curved, cernuous; lid conical.—*Eng. Fl. p.* 93; *Müll. Syn. pt.* 2. *p.* 323.

In marshes and streams. Fr. (rare) Summer. A fine luxuriant species, with leaves varying in colour from pale green to deep purple, according to the situations in which it is found.

64. HYPNUM ADUNCUM, Linn. (*Claw-leaved Feather Moss.*) Leaves falcato-secund, lanceolato-subulate, concave or almost semicylindrical, entire, the nerve disappearing below the summit; capsule oblongo-ovate, curved, cernuous; lid conical.—*Eng. Fl. p.* 94; *Müll. Syn. pt.* 2. *p.* 323.

In such localities as the preceding. Fr. Summer. The curious "clawed" or curled leaves of this species and its

varieties have a striking appearance. It is a large and luxuriant Moss, with much of the habit of *H. scorpioides.*

65. HYPNUM UNCINATUM, Hedw. (*Sickle-leaved Feather Moss.*) Leaves falcato-secund, lanceolato-subulate, serrated, striated, the nerve disappearing below the point; capsule cylindrical, curved, cernuous; lid conical.—*Eng. Fl. p.* 94; *Müll. Syn. pt.* 2. *p.* 322.

On moist banks, walls, and decaying wood, in shady situations, throughout mountainous and alpine districts. Fr. Spring and Summer. This is a common and very elegant Moss, at once distinguished in the districts where it is found by the bright green tints and hooked appearance of its foliage.

66. HYPNUM RUGULOSUM, Web. et Mohr. (*Wrinkle-leaved Feather Moss.*) Leaves secund, ovato-lanceolate, serrated, nearly plane, crisped transversely when dry, the margins recurved, the nerve reaching half-way; perichætial leaves adpressed, upright, and pale; capsule on an elongated red seta, inclined, and cylindrical; lid conical, with a slightly oblique beak.—*Eng. Fl. p.* 94. Hypnum rugosum, *Müll. Syn. pt.* 2. *p.* 423.

On heathy ground, near Thetford, in England; Breadalbane and other mountains of Scotland. Fr. (very rarely

T. lanuginosum

Trichostomum polyphyllum

T. heterostichum

found, and as yet unknown in Britain) Spring. The transverse undulations of the leaves when they are drying is a striking characteristic of the species. Hooker mentions that it is closely allied to *H. robustum*, a North American species.

67. HYPNUM COMMUTATUM, Hedw. (*Curled Fern Feather Moss.*) Stems pinnated; leaves falcato-secund, cordate, very much acuminated, serrated, their margins reflexed, the nerve disappearing below the summit; capsule oblong, curved and cernuous; lid conical.—*Eng. Fl. p.* 94; *Müll. Syn. pt.* 2. *p.* 422.

On moist, dripping rocks, and near waterfalls, especially in calcareous districts. Fr. Spring. The bright green cushions of this common but graceful species must be familiar to all, whether botanist or not, who visit the shelving or precipitous rocks, down which the streamlet trickles in its way to the river's bed. Its specific name, *commutatum*, or "changed," refers to the petrifying process to which its stems and foliage are frequently subjected by the deposition of calcareous matter from the water amid which it grows.

> "Contentment seems its dowry, as it throws
> Its golden mantle o'er the dripping rocks,
> And drinks the dews of heaven and the soft spray
> Of the small waterfall."

B. *Leaves unfurnished with a nerve, or furnished with two very indistinct ones at the base.*

68. HYPNUM SCORPIOIDES, Linn. (*Scorpion Feather Moss.*) Leaves secund, broadly ovate, ventricose, obtuse, somewhat apiculate, entire, nerveless, or obscurely two-nerved at the base; capsule oblongo-ovate, curved, cernuous.—*Eng. Fl. p.* 95; *Müll. Syn. pt.* 2. *p.* 94.

Turfy bogs, common. Fr. (rare) March. This is one of our largest British Mosses, and, by its size, the eye readily detects it in its native element. With the habit of *H. aduncum*, it is easily distinguished from that species and other affinities, by its broad leaves, unfurnished with nerves.

69. HYPNUM SILESIANUM, Beauv. (*Silesian Feather Moss.*) Leaves loosely imbricated, secund, narrow lanceolate, acuminate, serrated, nerveless, or very obscurely two-nerved at the base; capsule subcylindrical, erecto-cernuous; lid conical, obtuse.—*Eng. Fl. p.* 95. Hypnum Seligeri, *Müll. Syn. pt.* 2. *p.* 259.

On the ground among rocks, in the Scotch Highlands, not uncommon. Fr. Spring. Closely allied to the succeeding species, than which it is smaller and more straggling in its mode of growth. It is abundant in Switzerland, and seems there to grow on the stems of decaying trees.

70. HYPNUM CUPRESSIFORME, Linn. (*Cypress-leaved Feather Moss.*) Leaves closely imbricated, more or less falcato-secund, lanceolate, acuminate, entire, except at the points, which are usually serrated very faintly, two-nerved at the base; capsule cylindrical, erecto-cernuous; lid conical, with a point.—*Eng. Fl. p.* 95; *Müll. Syn. pt.* 2. *p.* 289.

Banks, wall-tops, woods, stems of trees, and various other localities, common. Fr. Autumn and Winter. We believe this common but elegant Moss will be well known to the youngest tyro. Though a very variable species, its usual form will easily be distinguished after a little observation from allied species. It is a species so widely distributed that Müller says it may be regarded as "cosmopolitan in its habits among Pleurocarpous Mosses, as *Didymodon purpureus* is among the Acrocarpous."[22] The two leading varieties enumerated by Hooker are

Var. *compressum*, with stems slender, compressed; leaves falcato-secund; growing in shady woods.

Var. *tenue*, leaves very slightly curved, narrow lanceolate, quite entire; mostly on trees.

71. HYPNUM CRISTA-CASTRENSIS, Linn. (*Ostrich-plume Feather Moss.*) Stems closely pectinated; leaves falcato-secund, ovato-lanceolate, acuminate, serrulate, striated,

faintly two-nerved at the base; capsule oblongo-ovate, curved, cernuous; lid conical:—*Eng. Fl. p.* 96; *Müll. Syn. pt.* 2. *p.* 296.

Shady woods and in more exposed situations, in mountainous and alpine districts. Not unfrequent in the Highlands of Scotland. Fr. (rare) Summer and Autumn. This "most elegant of all the *Hypna*," is one of the prizes which botanical tourists should endeavour to carry south, as a remembrance of the "land of brown heath and shaggy wood," for its graceful feathery branches suit admirably either for the scientific cabinet or the drawing-room scrap-book.

72. HYPNUM MOLLUSCUM, Hedw. (*Plumy-crested Feather Moss.*) Stems pectinated; leaves falcato-secund, cordate, much acuminated, serrated, scarcely striated, faintly two-nerved at the base; capsule oblongo-ovate, curved, cernuous; lid conical.—*Eng. Fl. p.* 96; *Müll. Syn. pt.* 2. *p.* 297.

On rocks and stones among trees, preferring calcareous soil. Fr. Winter. With much of the habit and character of the preceding, this species may at once be distinguished by its dwarfer and more compact habit, as well as by the ochraceous-yellow colour of the lower branches, and deep green of the upper.

Since the publication of Hooker's 'Muscologia Britannica' and 'British Flora,' vol. ii., several interesting additions have been made to various genera of the family, by discoveries of species and varieties hitherto undescribed as British. The most of these are recorded in the preceding pages, with their allied forms; but it has been thought desirable, from the size of the genus *Hypnum*, to record, as a supplement, a few of the most marked forms recently discovered, and ranked as species by Mr. Wilson and other careful observers.

1. HYPNUM ANDROGYNUM, Wils. (*Androgynous Feather Moss.*) Stem creeping; branches short, pinnately branched, somewhat robust and obtuse, cordato-ovate at the base, broadly lanceolate-acuminate, plano-concave, minutely serrate on the margin, glossy; perichætial leaves pale, squarrose, the footstalk rough; capsule incurvo-oblong, subcylindrical, with long operculum. Hypnum Starkii, *Müll. Syn. pt.* 2. *p.* 432. Rhynchostegium androgynum, *Br. & Sch. fasc.* lii. liv.

On stones and at the roots of trees in a moist situation near Hurstpierpoint, in Sussex, discovered by Mr. W. Mitten, in 1848. Only two localities are enumerated on the continent.

2. Hypnum cæspitans, C. Müll. (*Turfy Feather Moss.*) Forming broad deep-green tufts; stem creeping, branches short, rounded, divided in a somewhat pinnate manner; the cauline leaves crowded, adpressed, subrotund, oval, and lanceolate, shortly acuminate, concave without striæ, slightly revolute at the margin, subdenticulate at the apex, the nerve disappearing beyond the middle; the perichætial leaves few, appressed, acuminate, and entire; theca on a short, red, papillose stalk, short, narrow, erect, and oblongo-cylindrical; lid short, conical, obtusely apiculate; peristome with a broad annulus. Hypnum cæspitosum, *Wils. Eng. Bot. Suppl. t.* 2878. Scleropodium cæspitosum, *Br. & Sch. fasc.* lv. lvi. *p.* 2.

On walls, near Warrington, Mr. Wilson; and near Hurstpierpoint, Mr. Mitten. Mr. Spruce has also found it at the roots of trees, in moist meadows, in the western Pyrences. Allied in some points to *H. murale.*

3. Hypnum circinatum, Brid. (*Circinate Feather Moss.*) Broadly decumbent, rigid, dull green; stem creeping, with slightly rising branches, divided in a fastigiate manner into very short curved branchlets; the cauline leaves densely crowded, concave at the base, denticulated below and serrulate at the apex, margin very revolute at the base, with a

strong nerve disappearing at the point; perichætial leaves pale, stretching out into a long, attenuated, slightly reflexed point, subdenticulate; theca slightly inclined or subcernuous, on a strong, short, red pedicel; lid conico-acuminate, straight.

On calcareous soil near Dorking, Surrey, Mr. Mitten. It appears, according to Müller, to inhabit the "calcareous maritime districts of the whole of Europe, but everywhere very rare in fruit."

4. HYPNUM CIRRHOSUM, Schw. (*Cirrhose Feather Moss.*) "Very similar to *H. blandum*, but the branches are upright and more turgid; leaves broader, obtuse, with a somewhat long hair reflexing from the obtuse apex." The fruit has not been discovered. Ben Lawers, G. W. Lyon, Esq.

Found first on the Carinthian Alps, by Schwægrichen; afterwards in the Tyrol; Bavaria, and Sweden.

5. HYPNUM CONDENSATUM, Wils. (*Matted Feather Moss.*) "Stem creeping, with short, simple, incurved branches; the leaves ovate, concave, spreading, secund, serrulate, with plane margins; capsule erect, oblong; lid conical, sub-rostrate." Hypnum cæspitosum, *Wils.*

On sandstone walls at Longford, near Warrington, Mr. Wilson. More recently at Frodsham, Cheshire.

6. HYPNUM CONFERVA, Hook. and Wils. (*Confervoid Feather Moss.*) "Stems sparingly branched, not subpinnate as in *H. catenulatum* (its nearest congener); branches nearly erect, of a beautiful pale green above, with a slight tinge of pink below; leaves nerveless, slightly denticulate, narrower and tapering more upwards than those of *H. catenulatum*, equally patent, whether in a dry or moist state; perichætial leaves deeply but unequally serrated. Hypnum Sprucei, *Br.* Amblystegium Sprucei, *Br. & Sch.*

On shaded basaltic rocks "by the Tees side, below Winch Bridge," Mr. Spruce. Subsequently Mr. Spruce has found it on the Pyrenees. Perfect fruit has rarely if ever been found in Europe, but Drummond sent beautiful fertile specimens from Canada.

7. HYPNUM DEPRESSUM, Br. (*Compressed Feather Moss*) Stem subpinnate, shortly ramulose; leaves bifarious, compressed, oblong, more or less acuminate, with a double obsolete nerve; margin minutely serrate; capsule elliptical and oblong, subincurved, with a large, yellow, rostellate lid. —*Müll. Syn. pt. 2. p.* 258. Rhyncostegium depressum, *Br. et Sch. fasc.* xlix.–li. *p.* 8. Bridel regards it as a variety of *H. confertum.*

On stones and rocks in shaded places.

8. HYPNUM ELEGANS, Spruce. (*Elegant Feather Moss.*) Stem decumbent; narrowly flattened; branches distant, very flaccid, frequently divided into very slender, flagelliform, confervoid branchlets; cauline leaves loosely distichous, narrowly ovate, shortly flexuose, acuminate, deeply complicato-concave; margin erect, subdenticulate at the point, with two short nerves; capsule (on short red footstalks) pendulous, oblong, smooth; lid short, conico-acuminate.—*Ann. et Mag. of Nat. Hist.* 1849. Hypnum Bowerianum, *Spr.* (*MS.*)

Sandstone rocks, Eridge Park, near Tunbridge Wells; near Castle Howard, Eskdale; and near Bantry, Ireland.

9. HYPNUM INCURVATUM, Schrad. (*Incurved Feather Moss.*) Tufts very broad, flattened; stem creeping, the branches short, erect, and flexuose; cauline leaves secund, imbricated, narrowly ovato-acuminate, entire, concave, with two very short, slender nerves; perichætial leaves broadly sheathing, acuminate, nerveless; theca on a long, smooth footstalk, inclined, cylindrico-oblong; lid straight, conical, acute.—*Müll. Syn. pt.* 2. *p.* 416. Hypnum Swartzii, *Brid. Sp. Musc.* ii.

Moist rocks and hardy woods, in plains and alpine districts.

10. Hypnum Megapolitanum, Bland. (*Mecklenburgh Feather Moss.*) Broadly cæspitose; stem creeping, elongated, slightly branched; leaves spreading, loosely imbricate, ovato-acuminate, thin, reflexed at the base, and denticulate; nerve dimidiate, carinate; capsule horizontal, oblong, incurved.—*Müll. Syn. pt. 2. p. 353.* Rhynchostegium Megapolitanum, *Br. et Sch.* 49–51.

Near Shoreham, Sussex, Mitten, 1846. Found also throughout Germany, France, and the Western Pyrenees.

11. Hypnum pallidirostrum, Brid. (*Pale-beaked Feather Moss.*) Tufts spreading widely, slender, greenish-white; branches confervoid, pinnulate; cauline leaves erecto-patent, small, lanceolate, acute; margin erect, subdenticulate, with a green nerve disappearing before the point; perichætial leaves much larger, rising from a broad sheathing base, into a short denticulate acumen; capsule globose, or oval, on a strong, red, roughish seta; lid obliquely subulate.—*Müll. Syn. pt. 2. p. 413.* Hypnum pumilum, *Wils. in Eng. Bot. Suppl. t. 2942.*

12. Hypnum sarmentosum, Wahl. (*Sarmentose Feather Moss.*) Stem prostrate, elongate, purplish, and cuspidate; branches short, incurved, acute, pinnate, somewhat rigid; cauline leaves loosely erect, crowded, oblongo-ligulate, ter-

minated by a very short acumen bent inwards, concave or flattish; margin quite entire, with a purple nerve disappearing before the point; theca without an annulus. In other respects resembling *Hypnum cuspidatum*, or *trifarium*.—*Müll. Syn. pt.* 2. *p.* 380.

Brandon Mountain, Killarney. First discovered by Wahlenberg, on the Alps of Lapland.

13. Hypnum Teesdalii, Sm. (*Teesdale's Feather Moss.*) Stem loosely cæspitose; leaves short, narrowly lanceolate or oblongo-lanceolate, serrate at the point, the rib disappearing a little beyond the middle; capsule horizontally placed on a short, tuberculose pedicel, swelling beyond the neck, oval or ovate, of dense substance, olive-brown.—*Sm. Flor. Brit. pt.* 3. *p.* 1291; *Müll. Syn. pt.* 2. *p.* 400. Rhynchostegium Teesdalii, *Br. et Sch. fasc.* 49–51.

On moist rocks, especially near rivulets, or in moist cavities. Discovered near Teesdale, in Britain; since discovered in various localities on the Continent.

14. Hypnum umbratum, Wils. (*Shaded Feather Moss.*) Stem procumbent, irregularly fasciculato-bipinnate; pinnules incurved; cauline leaves remote, cordate or lanceolato-acuminate, furnished with a double nerve, sulcato-plicate, smooth, with a silky lustre, serrate on the margin;

leaves of the secondary branches smaller, shortly acuminate, intermixed with "paraphyllia," which are broadly lanceolate, longer, and deeply cleft; capsule on an elongated pedicel, with a lid shortly conical and apiculate.—*Müll. Syn. pt. 2. p.* 457. Hyloconium umbratum, *Br. et Sch. fasc.* 49–51.

Under the shade of trees, at a considerable elevation on the mountains. As a British plant, we believe it has been found only on the Scottish mountains, such as Glen Dole in Clova, and at the Trosachs in Perthshire. The two species to which it is allied are *H. proliferum* and *splendens*, from which, we trust, the description given above will enable the collector to distinguish it.

15. LESKEA PULVINATA, Wahl. (*Pulvinate Leskea.*) In small tufts, subpulvinate; stem and branches short; leaves broad, somewhat obtuse, soft, spreading in a moist state, entire; capsule on a short red pedicel, oval, and oblong; lid conical, somewhat obtuse; fugacious. Leskea subenervis, *Schw.* Neckera pulvinata, *Müll. Syn. pt. 2. p.* 84.

On the trunks of willows, by the River Ouse, near York, Mr. Spruce. M. Wahlenberg discovered this species in similar localities as the above in Lapland, and M. Blytt has since found it near Christiania and other places in Norway.

16. ORTHOTHECIUM INTRICATUM, *Br. et Sch.* (*Intricate Orthothecium.*) Stem prostrate, branched, stoloniferous; leaves crowded, subsecund, narrowly lanceolate, concave, the perichætial ones a little broader; capsule minute, suberect, brownish, oblongo-oval, or ovate; lid convex, or conical.

In Teesdale, Mr. Spruce. This species has been found in the mountains of both the north and south of Europe. The fruit is very rare, and has only been found in the alpine districts of Norway and Sweden. Its close ally among the *Hypnums* is *H. rufescens*, though a much smaller plant than that species.—Leskea intricata, *Hartman, Skand. Flor. edit.* 5, *p.* 336. Isothecium homomallum, *R. Spruce* (*MS.*)

HEPATICÆ, *Juss., De Cand.*

(*Lichen* and *Lichenastrum* of Dill. - Part of *Algæ*, Linn. *Musci Frondosi*, Sm. *Calyptratæ Deoperculatæ*, Mohr.)

"If by the microscopic glass
Survey'd, you'll see how far surpass
The works of nature, in design,
And texture delicately fine,
And perfectness of every part,
Each effort of mimetic art;
And as the gardener's watchful care,
The ground, of native clothing bare,
Indues with vegetable soil;
And with the waste's collected spoil
The tender plants exposed defends;
So the Great Gardener mindful sends
These mossy tribes wherewith to shun
The pinching frost, the scorching sun."

In the Introductory Chapter, we referred to the different forms of Cryptogamic Vegetation that had been classed, by Dillenius and other botanists of his and previous eras, among what are now regarded as true *Mosses*, comprising such forms as *Fungi, Lichenes, Algæ.*

Among these there is a family whose general appearance is so nearly allied to the Musci, as to render them popularly regarded as identical. The entire structure of some of them

so much resembles these, that we have thought a few remarks on them a suitable appendix to a history of the *Mosses*.

With that view we now proceed to briefly notice the general appearance and structure of the *Hepaticæ*, or Liverworts—as the family is usually called,—concluding with the specific description of a few of the leading forms and species generally distributed throughout the country, or more remarkable for their size and beauty.

The designations given to the family by respective authors, and enumerated at the head of the chapter, afford information on some points of their structure. Thus the term *Hepaticæ* refers to the liver-like expansion of *Marchantia*, and several species of the large genus *Jungermannia*. *Deoperculata* of Mohr suggests the important character of the want of an operculum, or lid to the capsule; and so on. To follow out this subject here, however, would occupy unnecessary space; so we are content to append the methods of classification adopted by various authors.

In *internal structure* the great bulk of the *Hepaticæ* resemble the Mosses, being composed, throughout, of cellular tissue, generally very lax, though in the *Marchantiaceæ* it is dense and opaque. The loose cellular tissue of the *Jun-*

germanniæ is manifested by the rapidity with which the plant withers, unless it is at once placed in the vasculum or on paper after being gathered. From the same cause it revives equally easily after being dry. In these cells will frequently be found minute particles of different colours, floating in a transparent fluid, which varies in different species, and in different parts of the same plant, being green, brown, purple, etc.

Taking in order the different parts of the plant, we find that the

Roots are primary and secondary; the former being only found in one or two *Jungermanniæ;* the latter abundant, and frequently very minute. In several species we find, as in various Mosses, that roots originate from different parts of the stem, leaves, and even of the fructification. An instance of this occurs in *Jungermannia complanata,* a common species.

The *Stem* is cellular throughout, and in the more regular branches of *Jungermannia* seems densest in the centre. It varies much in appearance, being, as in the *Marchantiaceæ* and frondose *Jungermanniæ,* mere flattened expansions, more or less dense and elongated; in one case minutely cut into segments, like some *Lichens* or *Algæ,* and in another

Weissia nigrita.

Weissia calcarea.

W. curvirostra

Zygodon conoideum

almost without sinuosities, when it has the appearance of some flattened *Cactus* on a small scale. These frondose stems are horizontal, and attenuated towards the edges. In the foliose species of *Jungermannia*, the stems form compact cushions, and in this state may readily be taken for true Mosses. The ramifications of various species are very elegant, as those can testify who have gathered in this or other lands the beautiful *Jungermannia tomentella*, or its allies. In secluded spots it forms

> "An emerald spot
> Romantic and most beautiful,
> Where print of human foot is not:
> Meet haunt for fairy bright or fay."

The forms and divisions of the stem and branches afford valuable characters for distinguishing species.

Leaves.—Sir J. E. Smith, and other authors who have followed him, have regarded not only the lichen-like branches of *Marchantia*, but most of the leafy expansions of *Jungermannia*, as modifications of fronds, and consequently consider this as a leading characteristic of the family. Nevertheless, with an eminent author, whose opinion we quote, we consider these expansions of cellular tissue equally entitled to the appellation of leaves as these organs in the true

Mosses. The *Fissidens* section of the genus *Dicranum* afford some illustration of a similarity of structure. In both the true Hepatic Mosses it has been remarked, that "the leaves and stems are always of one homogeneous, cellular substance, perfectly united and continuous; and there is never any solution of continuity between those parts, like the fall of the leaf in other plants, at any part of their growth." Thus, like the Mosses, they are sessile, permanent, and vary much in form, being ovate, orbicular, wedge and strap-shaped, etc. Most of this section of the *Jungermannia* have leaves, arranged in a bifarious or two-rowed manner; and these are either without folds, or clasp the stems in various ways. In several species the leaves consist of lobes, or divisions, deeply cut, and minutely fringed, forming elegant and beautiful objects for the microscope. Unlike the Mosses, the leaves of this family are entirely destitute of nerves, a character, among others, which shows that they hold a lower rank in the Vegetable Kingdom. In *Jungermannia pubescens*, and various foreign species, we find the surface of the frond covered with minute hairs, a character of which we have no example among Mosses. Again, while among these, especially some *Hypnums*, the leaves are often secund, or have a one-sided direction, the *Jungermannia*

juniperina is the only species in which this occurs among the *Hepaticæ*. The leaves surrounding the "anthers," are named perigonial, and vary little from the others; while the perichætial, surrounding the "female flowers," present a considerable diversity. Minute leaf-like bodies, named stipules, grow on the under side of the stems, in connection with the proper leaves of various *Jungermanniæ*, and afford subsidiary character for species.

If we now turn our attention to the organs of fructification, we shall find a still greater diversity between them and those of the Mosses. In the first place, the "male and female flowers," which are frequently associated together in Mosses, are always separate in this family. They are sometimes found on the same, and sometimes on different plants, monœcious or diœcious, chiefly the latter in the large genus *Jungermannia*.

The "male flowers"—*anthers* of Hedwig—are generally inconspicuous objects, requiring considerable research to detect. They grow from various parts of the stem or frond, and their usual appearance is that of circular bodies, supported on short, pellucid pedicels, which have been compared to the elongated receptacle of *Sphagnum*. In *Marchantia*, both male and female flowers are supported on elongated

stalks, containing at top clusters of their respective organs, which may be examined with a comparatively low microscopic power. What, however, is more properly the fruit, and most conspicuous to the naked eye, is the object figured in Plate XX. It usually consists of the following parts.

Calyx.—This, though by no means a conspicuous object, is rarely wanting. It forms a protection to the *calyptra*, which we shall presently notice; and its variations in structure and appearance will be found copiously detailed in the article *Musci* of Edinburgh Encyclopædia, vol. xv. p. 28.

The *Calyptra* is a more important organ than the *calyx*, and than the covering of the same name among Mosses. In these, we found it disappearing long before the maturity of the *capsule*; while in *Hepaticæ* it is usually of a more substantial fabric, and survives the dispersion of the spores, and decay of the capsule. It rises from the calyx, is tipped with an apparent style in an early stage, encloses the capsule, and is filled with a transparent fluid, which seems to afford some nourishment to the ripening fruit. In due time this fluid is absorbed, the capsule is extended, when, instead of —as in Mosses—rising as a covering, it decays, or remains to protect the delicate transparent footstalk, or rather elongated receptacle of the fruit.

Receptacle or Footstalk.—In no part of their structure is there a greater dissimilarity between the Mosses and Liverworts. Among the former, we found it a hard, firm, dark-coloured body, indicating more than any other part a connection with higher forms of vegetation; while in the latter the reverse is the case, as it consists of a mass of lax, elongated, cellular tissue, greenish, or, when fully developed, of pellucid whiteness, reminding one of the delicate stalks of minute Fungi, or "moulds." Some are so fugacious as to permit, in close damp weather, only of ten or twelve hours' duration between their bursting from the integuments of the calyptra and their final decay. This frail and evanescent character renders it difficult to meet with any but the fruit of the commonest species, or those where capsules are permanent or nearly sessile; and to the collector it is very tantalizing to meet sometimes, in his Spring walks, the green fronds of interesting species, covered with the decayed remains of capsules and stalks, which, if collected a few hours previously, would have afforded elegant objects for the herbarium.

Capsule.—This also, with the exception of *Andreæa*, Plate III., varies considerably from the spore-case of Mosses. When examined soon after escaping from the calyptra, it

is a dark, polished, ovate-shaped body, and, when these are numerous, may be compared to clusters of little black beads. By degrees it gets hardened from absorption; the divisions or sutures of which it is composed may be observed, and these at length split into four, or the other divisions characteristic of the species, discharging the spores which they contain. Mixed up with these spores we find, with few exceptions, numerous curious bodies, found also among *Equisetaceæ*, named *elaterēs*, which are spiral filaments, consisting of one or more threads, curiously twisted, and whose office seems to be the dispersion of these spores. This may be a provision of nature to make up for the want of a columella and more permanent capsule, which Mosses possess.

The *Spores* are very various as to form, size, surface, and colour. They are, in the majority of cases, spherical, and their size does not depend on that of the plant, some small species having large spores, and *vice versâ*. Hedwig and Necker made some interesting experiments, illustrating the germination of these *spores*, which are recorded in their works.

There are, in addition to these organs of fructification we have noticed, two sets of bodies found in several genera and species, to which, in closing, we would direct the attention

of our readers. These are, first, lenticular bodies, called *gemmæ*, imbedded in cup-shaped, sessile receptacles on the surface of the fronds of *Marchantia*. They have the power of producing perfect plants, and thus seem to have some analogy with the buds of higher vegetables.

Secondly, on the extremities of the stems and tips of the leaves of various species of *Jungermannia*, at certain seasons, green or yellowish powdery masses are found, which are analogous to similar bodies found on a few of the Mosses, especially that woodland favourite the *Tetraphis pellucida*.

The *Hepaticæ*, though, comparatively speaking, a small section of the large family of *Cryptogamia*, present considerable variation in the form and structure of both their conservative and reproductive organs. These have been carefully examined, and made the basis of different classifications, as various authors viewed their respective importance.

The large genus *Jungermannia* is itself a study, and has been well wrought out by the labours of Hooker and Taylor in our own country, and by Lindenberg* and others on the Continent.

Dr. Taylor's remarks on the various genera and species

* His work, 'Synopsis Hepaticarum Europæarum,' has been described as "a model of accurate description and profound research." The contributions of Hooker and Taylor merit similar praise.

of this family in the 'Flora Hibernica,' are very full. The classification he adopts is subjoined.

† Seeds accompanied by spiral filaments in the capsule.

A. Common receptacle of the genera pedunculated.

B. Common female receptacle none.

†† Seeds unaccompanied by spiral filaments.

Lindley, in his 'Vegetable Kingdom,' an elaborate and standard work, classes the large families of Mosses and Liverworts under the Muscal Alliance (*Muscales*). Among these he includes the *Equisetaceæ**. Subjoined is the arrangement adopted by him.

HEPATICÆ.

Ricciaceæ.—Spore-cases valveless, without operculum or elaters.

Marchantiaceæ.—Spore-cases valveless, or bursting irregularly without operculum, but with elaters.

Jungermanniaceæ.—Spore-cases opening by a definite number of equal valves, without operculum, but with elaters.

Equisetaceæ.—Spore-cases peltate, splitting on one side, without operculum, and with an elater to every spore.

* "*Equisetum* may be regarded as a link between this (Muscal) Alliance and *Chara* on the one hand, while its high degree of composition brings it into the neighbourhood of Ferns and Club-Mosses." (Vegetable Kingdom, p. 56.)

The following is the order of the Genera described in the 'English Flora,' vol. ii.:—

Riccia.
Sphærocarpus.
Anthoceros.
Targionia.
Marchantia.
Jungermannia.

RICCIA, *Linn.* (Riccia.)

Generic Character.—Capsule spherical, immersed in the frond, indehiscent, crowned with a style, which alone is protruded.—Named after Ricci, a botanist of Florence.

1. Riccia crystallina, Linn. Frond carnose, ovato-oblong, two- or three-lobed, the divisions dichotomous.

On banks, etc. Fr. March and April. This plant varies considerably in appearance, according to the situation in which it grows. The most marked, according to Hooker, are, var. *glauca* (*R. glauca*, Linn.), growing in dry situations; the frond is fleshy, glaucous in colour, and furrowed, with acute segments: var. *irrigua*, in moist situations, damp

garden stoves, etc.; frond thin, nearly plane, yellowish-green, segments obtuse.

ANTHOCEROS, *Linn.* (ANTHOCEROS.)

Generic Character.—Capsule pedunculated, linear, two-valved, with a central columella, to which the seeds are attached, and arising from a tubular perianth.—Named "Hornflower" from the appearance of its capsule.

1. ANTHOCEROS PUNCTATUS, Linn. Frond obovato-oblong, flattish, and cut at the margin; in substance, between fleshy and membranaceous, dark green, and paler at the margin; cellules of the frond distinct, oblong; destitute of midrib; male fructifications spherical, shortly pedicellate, yellowish-orange, enclosed in cup-shaped, deeply-laciniate receptacles; female fructifications arising from conical tubercles (the perianths) of the colour of the stem, from whence proceeds a linear, subulate, slightly-curved capsule, which bursts at the extremity into two narrow linear valves. In the centre is a filament or columella, to which are attached many roundish, opaque, brown seeds, or rather capsules, as each contains three or four smaller bodies.

MARCHANTIA, *Mich.* (MARCHANTIA, OR LIVERWORT.)

Generic Character.—Common receptacle of the fruit pedunculated, peltate, bearing beneath shortly pedicellated pendent capsules, opening at the extremity, with about eight teeth, and filled with seeds and spiral filaments. Male fructifications oblong, imbedded in a flat, carnose, sessile, or pedunculated papillary disc. Gemmæ on the frond lenticular, contained in various-shaped receptacles, germinating frequently before leaving the parent frond.—Named in honour of Nicholas Marchant, an eminent botanist.

1. MARCHANTIA POLYMORPHA, Linn. (*Polymorphous Marchantia.*) Receptacles of the capsules deeply cut, in a stellated manner, into about ten narrow segments; that of the anthers pedunculated.—*Eng. Fl. p.* 102.

Moist and shady situations, everywhere common. Fr. July.

2. MARCHANTIA HEMISPHÆRICA, Linn. (*Hemispherical Marchantia.*) Receptacles of the capsules hemispherical, cut at the margin into four to ten equal lobes; that of the anthers pedunclated with a thin margin; frond with large cells and pores.—*Eng. Fl.*

On sides of millponds, watercourses, and on shady banks, common. Fr. March.

3. MARCHANTIA CONICA, Linn. (*Conical Marchantia.*) Receptacle of the capsule conical, ovate, somewhat angular, nearly entire at the margin; that of the anthers sessile.—*Eng. Fl. p.* 103.

Sides of mountain-streams and on moist banks. Fr. April. The study of this group is one of no common interest; and we hope that many readers will avail themselves of opportunities of collecting both their fronds and fructifications, and comparing them with the full descriptions given by Dr. Hooker and Taylor, in the works we have referred to.

JUNGERMANNIA, Linn. (JUNGERMANNIA.)

Generic Character.—Common receptacle of the fruit none. Perianth or calyx monophyllous, tubular, sometimes double, rarely wanting. Capsule four-valved, terminating a peduncle, which is longer than its perianth.—Named in honour of Louis Jungermann, a German Botanist.

This extensive genus, so widely distributed throughout our own and other lands, cannot have, in the few pages we devote to it, that notice to which it is entitled. We must be satisfied with describing a few of the more common or interesting species, selecting such as illustrate the

different sections into which they have been arranged by the careful investigations of the author of the 'British Flora.' This will enable the beginner to form some acquaintance with the form and arrangement of the leaves and stipules, an important but somewhat difficult task. The plates in Hooker's 'British Jungermanniæ,' a work in most botanical libraries, will also afford much aid.

I. Foliaceous.

A. *Stems without stipules**.

a. *Leaves inserted on all sides of stem.*

This section is represented by *J. Hookeri*, Sw., a curious and very rare species.—*Eng. Fl. p.* 107; *Hook. Br. Jung. pl.* 54.

b. *Leaves bifarious.*

* *Leaves undivided.*

1. Jungermannia asplenioides, Linn. (*Spleenwort Jungermannia.*) Stems ascending, branched; leaves obovato-rotundate, ciliato-dentate, somewhat recurved; fruit terminal and lateral; perianth oblong, compressed, oblique; the mouth truncated, subciliated.—*Eng. Fl. p.* 107; *Hook. Br. Jung. pl.* 13.

* *J. Sphagni* and *J. compressa*, in this division, have stipules only on their young shoots.

Shady banks, and on rocks in moist woods, abundant. Fr. April. A large and easily recognized species. Stems 3–6 inches long.

2. JUNGERMANNIA CORDIFOLIA, Hook. (*Heart-leaved Jungermannia.*) Stems erect, flexuous, dichotomous; leaves erect, concave, cordate, circumvolute; fruit terminal and axillary; perianth oblongo-ovate, subplicate; the mouth minute, denticulated.—*Eng. Fl. p.* 109; *Hook. Br. Jung. pl.* 32.

Bog-springs and in boggy ground. Fr. Spring. The foliage is soft and thin, of a dark lurid-green colour.

** *Leaves emarginate or bifid; the segments equal.*

3. JUNGERMANNIA EMARGINATA, Ehrh. (*Notched Jungermannia.*) Stem erect, branched; leaves loosely imbricated, patent, obcordate, emarginate; fruit terminal; perianth ovate, toothed, immersed in the perichætial leaves.—*Eng. Fl. p.* 110; *Hook. Br. Jung. pl.* 27.

On wet rocks in mountainous districts. Fr. Spring. A distinct species, of a dark purple colour.

4. JUNGERMANNIA BICUSPIDATA, Linn. (*Forked Jungermannia.*) Stem procumbent, branched in a stellated manner; leaves subquadrate, acutely bifid, the segments acute, straight, entire; fruit radical; perianth linear, oblong, lon-

gitudinally plicated, the mouth toothed.—*Eng. Fl. p.* 111; *Hook. Br. Jung. pl.* 11.

On trees, hedge-banks, and moors, frequent. Fr. Spring. This elegant species is remarkable for its pale yellow-green colour. The cellular structure of the foliage is also distinct and beautiful, far surpassing the work of art.

> "Thus is Nature's vesture wrought
> To instruct our wandering thought;
> Thus she dresses green and gay,
> To disperse our cares away."

**** Leaves tri- or quadrifid; the segments equal.*

5. JUNGERMANNIA PUSILLA, Linn. (*Dwarf Jungermannia.*) Stem procumbent, nearly simple; leaves horizontal, quadrate, waved, large, irregularly bifid or trifid; fruit terminal; perianth campanulate, the mouth much spreading, waved, and cut; capsule globose, bursting irregularly. —*Eng. Fl. p.* 113; *Hook. Br. Jung. pl.* 69.

Moist shady banks, preferring such as are of clay. Distinguished by long purple radicles, which issue from the under side of its short stems.

***** Leaves bifid; the segments unequal, conduplicate.*

6. JUNGERMANNIA ALBICANS, Linn. (*Whitish Jungermannia.*) Stem erect, slightly divided; leaves unequally

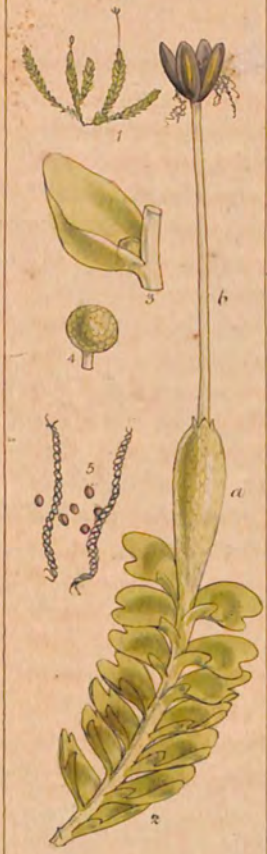
two-lobed; the lobes conduplicate, with a pellucid line in the middle, serrated at the point; the upper ones oblongo-ovate, acute; the lower ones larger, somewhat scimitar-shaped; fruit terminal; perianth obovate, cylindrical, sub-compressed; the mouth contracted, plicate, toothed.—*Eng. Fl. p.* 114; *Hook. Br. Jung. pl.* 25.

Moist banks. Fr. Spring. A neat and common species, covering the ground to a great extent.

7. JUNGERMANNIA COCHLEARIFORMIS, Weis. (*Hollow-leaved Jungermannia.*) Stem procumbent, nearly simple; leaves imbricated above, unequally two-lobed, conduplicate; the upper lobes larger, convex, bifid, and serrated at the point; the lower oblongo-ovate, saccate.—*Eng. Fl. p.* 115; *Hook. Br. Jung. pl.* 68.

Moist moors and rocks, in the Highlands of Ireland and Scotland. A large species, 4–6 inches, of a rich purple colour.

8. JUNGERMANNIA COMPLANATA, Linn. (*Flat Jungermannia.*) Stem creeping, vaguely branched; leaves distichous, imbricated above, unequally two-lobed; the upper lobes larger, orbicular; the lower ones ovate, appressed, plane; fruit terminal; perianth oblong, compressed, truncate.—*Eng. Fl. p.* 116; *Hook. Br. Jung. pl.* 81.



Jungermannia inflata.

Marchantia polymorpha.

Lycopodium clavatum.

Fitch lith.

V Brooks imp

On trunks of trees, common. Fr. at various periods of the year. Growing in circular patches of a pale green colour, reminding one of some species of lichens.

B. *Furnished with stipules.*

a. *Leaves entire or rarely emarginate.*

9. JUNGERMANNIA POLYANTHOS, Linn. (*Many-flowered Jungermannia.*) Stem procumbent, somewhat branched; leaves horizontal, roundish, quadrate, plane, entire, and emarginate; stipules oblong, bifid; fruit on short branches from the under side of stem; perianth half the length of the calyptra, two-lipped, laciniated.—*Eng. Fl. p.* 117; *Hook. Br. Jung. pl.* 62.

Wet ground. Fr. Spring. Remarkable for its square leaves and peculiar fruit.

b. *Leaves bi-tri-fid or -partite; the segments equal.*

* *Stipules much smaller, and very distinct from the leaves.*

10. JUNGERMANNIA REPTANS, Linn. (*Creeping Jungermannia.*) Stem creeping, stellatedly branched; leaves imbricated on the upper side, subquadrate, incurved, acutely quadridentate; stipules broadly quadrate, quadridentate; fruit dorsal; perianth oblong, plicate, the mouth toothed. —*Eng. Fl. p.* 119.

In woods and on rocks in shady places, frequent. An

elegant little species, forming a graceful net-work with its branches, and making

"Rough barren rocks grow pregnant with delight."

11. JUNGERMANNIA TRILOBATA, Linn. (*Three-toothed Jungermannia.*) Stem creeping, flexuose, branched; leaves imbricated on the upper side, ovate, convex, obtusely tridentate at the point; stipules broadly subquadrate, crenate; fruit dorsal; perianth oblong, subacuminate, the mouth cleft on one side.—*Eng. Fl. p.* 119; *Hook. Br. Jung. pl.* 76.

Moist spots in high grounds, among rocks. A large and easily recognized species.

** *Stipules as large as the leaves or nearly so, and easily confounded with them.*

12. JUNGERMANNIA JUNIPERINA, Sw. (*Juniper-leaved Jungermannia.*) Stem erect, flexuose, nearly simple; leaves and stipules linear-lanceolate, bipartite, straight or falcato-secund; fruit terminal; perianth ovate, laciniated, bearing perichætial leaves.—*Eng. Fl. p.* 120; *Hook. Br. Jung. pl.* 4.

Among rocks on lofty mountains. A marked species, with the habit and colour of *Andreæa.*

C. *Leaves bifid, lobes unequal, conduplicate.*

* *Lower or smaller segments plane.*

13. JUNGERMANNIA PLATYPHYLLA, Linn. (*Flat-leaved*

Jungermannia.) Stem procumbent, pinnately branched; leaves unequally two-lobed; the upper lobes roundish-ovate, nearly entire; the lower ones and stipules ligulate, entire; fruit lateral; perianth ovate, compressed, the mouth truncated, inciso-serrate, cleft on one side.—*Eng. Fl. p.* 121; *Hook. Br. Jung. pl.* 40.

On walls, rocks, and trees, common.

14. JUNGERMANNIA TOMENTELLA, Ehrh. (*Spongy Jungermannia.*) Stem suberect, bipinnate; leaves nearly plane, unequally two-lobed, capillari-multifid, upper lobes bipartite, the lower ones minute; stipules subquadrate, laciniated; fruit axillary; perianth oblong, cylindrical, hairy, the mouth open.—*Eng. Fl. p.* 122; *Hook. Br. Jung. pl.* 36.

Moist places throughout the country, but not common. Fr. (rare) March. A peculiar and beautiful species.

** *Lower or smaller segments of the leaves involute.*

15. JUNGERMANNIA SERPYLLIFOLIA. (*Thyme-leaved Jungermannia.*) Stem creeping irregularly, pinnated; leaves unequally two-lobed; upper lobes rounded; lower ones minute, involute; stipules rounded, acutely bifid; fruit lateral; perianth obovate, pentagonal, the mouth contracted, elevated, and somewhat toothed; capsule pellucid, quadrifid. —*Eng. Fl. p.* 123; *Hook. Br. Jung. pl.* 42.

Trees and rocks in subalpine districts. Fr. Spring.

**** Lower or smaller segments of leaves saccate.*

16. JUNGERMANNIA DILATATA, Linn. (*Dilated Jungermannia.*) Stem creeping, irregularly branched; leaves unequally two-lobed; the upper lobes roundish, acute; the lower ones roundish, saccate; stipules roundish, plane, emarginate; fruit terminal; perianth obcordate, tuberculated, triangular.—*Eng. Fl. p.* 125; *Hook. Br. Jung. pl.* 5.

Trunks of trees, common. Fr. Winter and Spring. So common as to give a character to the scenery by the numerous brown patches it forms on trees of all kinds. *J. Tamarisci*, the next species, resembles it much. It however affects subalpine districts, and has longer and more regularly pinnate *stems*.

II. FRONDOSE.

a. *Fronds destitute of nerve.*

17. JUNGERMANNIA MULTIFIDA, Linn. (*Many-lobed Jungermannia.*) Frond linear, nerveless, fleshy, compressed, bi-pinnatifidly branched; fruit marginal; perianth very short, the mouth dilated, fimbriated; calyptra exserted, oblongo-cylindrical, tuberculated.—*Eng. Fl. p.* 126.

On damp heaths, sides of ditches, etc. Fr. Spring. Well marked by its deep-green multifid segments.

b. *Fronds furnished with a nerve.*

* *Perianth single.*

18. JUNGERMANNIA BLASIA, Hook. (*Flask-bearing Jungermannia.*) Frond oblong, submembranaceous, dichotomous, costate, with scattered toothed scales below; fruit arising from the upper side of the costa; perianth and calyptra within the frond.—*Eng. Fl. p.* 126; *Hook. Br. Jung. pl.* 82, 83, 84. Blasia pusilla, *Linn.*

Moist ground in mountainous and subalpine districts. Fr. (rare) Spring. A curious species. For ample details we refer to Sir W. J. Hooker's admirable Monograph.

19. JUNGERMANNIA EPIPHYLLA, Linn. (*Broad-leaved Jungermannia.*) Frond oblong, submembranaceous, irregularly divided, obscurely costate, the margin entire or somewhat lobed, sinuated; fruit from the upper side of the frond, and near the apex; perianth subcylindrical, plicate, the mouth somewhat dilated, inciso-dentate; calyptra exserted, smooth.—*Eng. Fl. p.* 126; *Hook. Br. Jung. pl.* 47.

On rocks and stones by the side of streams. Fr. Spring. This species, when found without fruit, will readily be mistaken for a *Marchantia,* as its fronds are broad and succulent. The capsules are numerous and ornamental, whether in a young or matured state, and make their appearance—

"When the streams break forth from their wintry chains,
In the joyous months of Spring,
And the earth is glad with the gentle rains,
And the cuckoo comes to sing."

There is a variety found in dry situations in the winter months, with the fronds dichotomously divided at the apex.

20. JUNGERMANNIA FURCATA, Linn. (*Forked Jungermannia.*) Frond linear, dichotomous, membranaceous, costate, glabrous above, beneath and on the margin more or less hairy; fruit from the midrib on the under side; perianth two-lobed, conduplicate, the margin ciliated; calyptra obovate, crisped.—*Eng. Fl. p.* 127; *Hook. Br. Jung. pl.* 55.

On trunks of trees, moors, and rocks, etc., abundant. Fr. Winter and Spring. A common and well-marked species. The rock variety is larger and more elongated.

** *Perianth double.*

20. JUNGERMANNIA LYELLII. As this species, the only representative of the subsection, is rare, we do not give the description. It was first discovered by C. Lyell, Esq., in Hampshire and Forfarshire.

THE MANTLE OF MOSS.

I.

Now autumn's fruits and flowers are gather'd in,
And wither'd foliage fled the leafy grove;
The ample flood leaps foaming o'er the linn,
And all seems dark and drear where'er we rove.
Has Phœbus' chariot then forgot to move?
Does Nature falter in her bright career?
Will winter's gales but desolation prove,
And sing the requiem of the faded year?
Nor leave one floret still our wandering steps to cheer?

II.

How bleak the landscape where the wither'd stems
Alone remain to deck the wintry scene!
Where late were cull'd the Harebell's nodding gems,
A few decaying leaves are all we glean
In botanizing; brown the faded heath;
'Mid rustling reeds in marshy grounds at times
The wind is howling, charged with work of death;
No more the woodland echoes with the chimes
Of summer minstrels, lately 'scaped to sunnier climes.

III.

But though in rural walks we meet no more
The bright-eyed children of long summer days,
Again the verdant landscape to restore,
Another race will court the admiring gaze;

These are new tenants of the hill and dale,
The rock, the woodland, and the flowing stream,
Whose glossy branches now alone avail
To catch the wintry noonday's dusky beam,
And from desponding fears our hopes again redeem.

IV.

We speak not now of glossy frond of Fern,
Standing erect amid the prostrate race;
Of lurid Fungus, or of cup-shaped urn
Of hoary Lichen, whose broad shields now grace
The rocks and stones and trees with varied band;
Forming the nucleus of a nobler birth,
Cradled in storms, and nurtured by the hand
That clothes with varied forms the face of earth,
And fills creation's fields with joy and mirth.

V.

Where'er our devious path we now may turn,
To copse or meadow, vale or mountain grey;
To massive rocks, whose fronts o'ershade the "burn,"
Hurrying its eddying waters to display
The foaming waterfall, a race is seen
Of verdant Mosses glistening in the light,
And decking with their emerald fronds the scene,
Where lately, "peopled with creation bright,"
The many-tinted landscape met the observer's sight.

VI.

Of these the Feather holds the foremost rank,
Rivalling the Cypress, Fern, and Ostrich Plume,
Glistening by woodland path, or on the bank,
Now stript entire of spring and summer bloom;

Earth's verdant mantle to protect the germ
Of plant and insect life from winter's cold,
'Midst which the tiny branches, without harm,
Luxuriate in hues of green and gold,
And forms which tyro puzzle to unfold.

VII.

Then Bryum,—with its tufts of pleasant green,
Silvery bright, lurid, and paly red;
And thready footstalks, tipp'd with graceful mien
Of drooping capsule, whose projecting lid
Conceals the double row of curious teeth,—
Clothing with verdure every bank and wall,
The woodland, mountain-cliff, and e'en beneath
The crystal dripping of the waterfall,
Will raise luxuriantly its branches tall.

VIII.

Bartramia, with its apples, loves the shade
Of shelving cliffs, whence rise its cushions palé;
Hookeria clothes with shining frond the glade,
Where 'mid the moisten'd copsewood ever trail
Loose grass and woodland florets; overhead
The curled Bristle decks the spreading bough;
While in the neighbouring streamlet's rocky bed
The lanky stems of Fontinalis grow,
Shelter'd alike from winter's cold and summer's glow.

IX.

When sultry July with its fervid beam
Has parch'd the Mosses on the lowland mead,

Splachnum and Sphagnum with the polish'd gleam
Of graceful urn by mountain streamlet feed,
Mingled with squarrose Fork Moss, and the flowers
Of alpine floret's evanescent bloom,
The mountain breezes and the passing showers,
Envious, as 'twere, that others share the room
Of rare and humble beauties saved from winter's tomb.

X.

Protean, yet simple, are the numerous forms
Of grace and beauty that adorn the soil,
Whose diverse structure, shelter'd from the storms,
The Cryptogamic student may beguile
A leisure hour in searching. Close we now
Recording "beardless" tenants of the field,
Weissia, Screw Moss, green and purple glow
Of Moss Hepatic's silver-pencill'd shield,
Whose fronds of varied hue a close protection yield.

XI.

"Parent of Good!" we recognize thy hand
In these minuter objects of thy care;
Tread we the mountain's brow or ocean's strand,
The humblest of thy works thy praise declare.
Thus we are taught thy wisdom and thy power,
By care of sparrow's plume and moss's frond,—
Much more of nobler creatures. Let the flower
And verdant sward, that clothes the arid ground,
Show us thy love display'd in Nature's field around.

GLOSSARY.

Acuminate (leaf): tapering to a point.

Apiculate (leaf): furnished with a minute, but distinct point.

Arcuate (seta): curved in the form of a bow.

Bifarious (leaves): arranged in two rows.

Bifid (stipules of *Jungermanniæ*): two-cleft. In the same way *trifid*, three-cleft, and *quadrifid*, four-cleft, are employed.

Campanulate (calyptra): bell-shaped.

Canaliculate (leaf): furnished with a channel or furrow on upper surface.

Carinate (leaf): furnished with a projective nerve beneath, in the form of a keel.

Cernuous (capsule): drooping, but less so than to be described as "pendulous."

Ciliated (calyptra and leaf): furnished with an evident fringe.

Connivent (leaves): closely approximating.

Convolute (leaf): rolled together, somewhat in the way of involute.

Cuspidate (leaf): furnished with a somewhat lengthened and rigid point.

Dentate (leaf): furnished with minute teeth; *denticulate* is a diminutive.

Diaphanous (leaf): thin and transparent.

Dimidiate (calyptra): cleft longitudinally on one side.

Excurrent (nerve of leaf): extending beyond flat surface of leaf by its apex.

Falcate (leaf): curved in the way of a sickle or pruning-hook.

Fimbriated (leaf or capsule): fringed in a greater degree than "ciliate" leaves.

Flexuous (leaf or stem): twisted in an irregular manner.

Geminate (teeth of peristome): arranged in pairs.

Gibbous (capsule): having the appearance of being swollen.

Glabrous (leaf and stem): free from roughness.

Imbricated (leaves): overlapping each other.

Involute, rolled inwards.

Laciniate (leaf): cut at margin into narrow strips

Ligulate (leaf): in the form of a tongue or strap.

Mucronate (leaf): with a more decided point than "apiculate;" *mucronulate* is a diminutive.

Oblong (leaf): three or four times longer than broad, a term used with considerable latitude.

Obovate (leaf): the ovate leaf reversed, having the narrow end attached to stem.

Ovate (leaf and capsule): egg-shaped, broad and rounded at the base, and tapering towards the extremity.

Oval (leaf): of the same character as oblong, but somewhat broader.

Pendulous (capsule): drooping to a greater degree than "cernuous."

Piliferous (leaf): furnished with hairs at the extremity.

Pyriform (capsule): pear-shaped.

Recurved (leaf): rolled backward from the margin.

Reticulate (leaf, etc.): presenting in its structure the appearance of network.

Rostrate (lid of capsule): pointed in the shape of a bird's beak, or similar object.

Secund (leaves): inclining to one side of stem.

Serrate (leaf): indentate, or margin like a saw.

Sessile (leaf and capsule): attached to stem without any distinct stalk.

Setaceous (leaf): resembling the bristles of animals.

Squarrose (leaf): with extremity very much reflexed.

Striated (leaves and capsule): furnished with "striæ," or streaks, more or less prominent.

Strumose (capsule): furnished with a thickened part below capsule.

Subulate (leaf and capsule): formed like an awl.

Sulcated (leaf): furnished with grooves or furrows.

Turbinate (capsule): shaped like a peg or top.

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